THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. AUGUST 3, 1899. CHICAGO, ILL. NUMBER 31

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On Page **25.**

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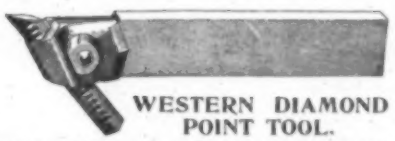

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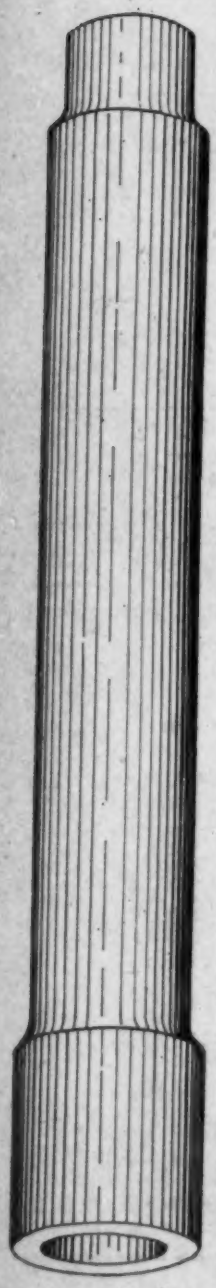

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. AUGUST 3, 1899. CHICAGO, ILL. NUMBER 31

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

What appeared one week ago to be a lull in the buying movement was followed quickly by a renewal of activity, and plainer indications that the climax is still in the distance. Labor troubles at Lake Erie docks, that might have caused serious interruption to the ore movement, have been settled. The strike of finishers in Mahoning Valley mills was adjusted on a basis amounting practically to a 25 per cent straight advance. Labor is certainly getting its share, when it is understood that deliveries, both from furnace and mill are still being made at prices far below those ruling to-day. The inquiry of the past week, both for pig iron and finished forms, shows that many consumers will need material considerably in excess of calculations and that the probabilities of shortages in the next five months are increasing rather than decreasing. Already the difficulty of getting material is the prominent feature of the situation. Shipments of foundry and Bessemer irons are short of current requirements, and temporary shut-downs are inevitable in the case of a number of foundries, while steel works operations in the Central West have been interrupted because of short supply of iron. Another development of prime importance, emphasized in the past week, is the increased buying for delivery next year. Large concerns are covering at current prices for the early months of 1900. The shortages on Lake Superior ore shipments by water may be made up in part by all-rail shipments next winter, but this will be at a much higher freight rate, which will mean further advances in prices of pig iron. As the year advances and the output of pig iron grows at a pace still slower than the increase of consumption, it is seen that the activity of newly started plants is often at the expense of the labor supply at others. There is a good deal of shifting of labor, but still a marked shortage in all departments of iron and steel manufacture—at iron mines, coal and coke properties, blast furnaces, steel works, finishing mills, foundries. Calculations as to prices for next year must take account of this very important factor. Plans for expansion of production will not be executed without a larger supply of capable labor. All interruptions of operations now under way, due to strikes, will mean that much additional shortage. The East is probably behind the West in the matter of contracting for next year, but the past week has shown considerable additions to the books, not only of Eastern foundry iron furnaces, but of steel works and rolling mills. Bessemer iron is firm at $21 at Central Western furnace for delivery in the last quarter of 1899, and quotations for next year are $20 to $21. Steel billets are now $34.50 to $35, Pittsburg, and rails $31 and $32. The scarcity of steel promises to be more pronounced in the next four months. In the Chicago district some inquiry for rails for delivery next year is noted. Railroad car requirements will be large in the remainder of the year, Southern roads in particular needing additional equipment. Foreign markets are keeping pace with the advance in the United States. Middlesbrough warrants have touched 75 shillings, and no such shortness of pig iron deliveries has been seen in the North of England since 1873.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Aug. 2.

The month just ended has been the most remarkable July in the history of the American iron trade. Toward the end of spring the most sanguine in the iron trade predicted that there would be a lull in June and July, with a moderate recession in prices, to be followed by advances to still higher levels. The market on the contrary has advanced without any reaction whatever, and the prospects now all indicate further advances.

The strongest and most important feature of the general iron and steel market is the marked tendency to place business for next year. Orders are coming in quite freely for partly finished material from manufacturers who are selling their products for actual consumption next season, and the extent to which this is being done is a guaranty that consumption will not be interfered within most lines by the high prices, and proves further that there is a general confidence in the maintenance of prices at the present or a higher level. That the matter of making purchases for next season's requirements should have been taken up so generally in a month always before characterized by dullness lends emphasis to the indication.

Signs all along the line now point positively to a shortness of material. There have been some serious interruptions to Bessemer steel production on account of a lack of pig iron, and there is likely to be more trouble. Blast furnaces have been receiving a sufficient amount of ore, but the trouble here will be after the close of navigation. Great difficulty is being experienced in finding men in the ore region, and consumers fear that the close of navigation will find the shipments of ore not up to the sales for the season. Difficulty has also been experience on account of water in some of the mines. The amount of ore which may have to be hauled by rail during the winter is likely to be considerable, and while there may be no interruption to smelting, the cost of ore, with rail transportation added, will be such as to strengthen prices materially.

The week has been a rather quiet one so far as sales of the cruder forms of material are concerned, but such sales have been sufficient, on account of the general scarcity, to maintain and even advance prices. In finished materials some important contracts have been made for delivery during next year, at full prices.

PIG IRON.—Sales of Bessemer pig iron during the week, for this year's delivery, have amounted to about 17,000 tons. For the month of July the total turnover was about 50,000 tons. Prices on Bessemer have advanced until nothing can be secured below $12, valley furnace. Some round lots have also been sold at this price for delivery during the first six months of next year. For August iron a premium of a dollar or two a ton could very readily be secured, but the iron is not to be had, and there is very little for even the later months of the year. The sales for next year are mainly to steel interests who finish the material, and have sold their product already. The trade in foundry iron has been rather more active than for two or three weeks past. Some foundries have purchased round lots of iron for the first half of next year, mainly to cover for sales made. Prices on all grades are up about 75

cents a ton, and foundry iron is very scarce for delivery during the next few months. Gray forge has been fairly active, and prices are a trifle higher. The lowest figure last week cannot be done in the Pittsburg market, and $17 75 has been paid. In the valley the market for gray forge is just a shade stronger. We quote prices as follows:

Bessemer, valley furnace	$21.00		
Bessemer, Pittsburg	21 75		
No. 1 Foundry	20.50	to	21.00
No. 2 Foundry	20.00	to	20.50
No. 3 Foundry	19.50	to	20.00
Gray Forge, valley furnace	17.25	to	17.40
Gray Forge, Pittsburg	17.65	to	17.75

STEEL.—The market has been rather quiet in steel billets, and sales are confined almost entirely, in Bessemer, to material re-sold by consumers and middlemen. There are very few sellers. We advance quotations by $1 a ton this week, to $34.50 to $35 at mill. Slabs are a shade higher than billets, and sales have been made at $35, and even $36 is reported to have been paid. Some odd lots of wire rods have been sold to chain makers and others at $38. There is the greatest scarcity in the steel market, and some good sized lots could readily be sold for almost any delivery this year, could delivery be guaranteed, at full prices. Operations at steel works have been much hampered during the past week from an insufficiency of iron. Two interests in the Central West have been out of operation for several days on account of a shortage of pig, and a Wheeling district mill has decided to lay off the last two days of the week, with the hope of resuming Monday. Open-hearth steel is very strong. We note sales of basic open-hearth billets at $45 and $45 80, Pittsburg.

FERRO-MANGANESE.—This line remains unchanged at $85 for domestic 80 per cent, in large lots.

RAILS AND TRACK MATERIAL.—There is practically nothing doing in the rail market and quotations are nominal at $30 for, say, 50 to 100 tons, $31 for carloads, and $32 for lesser quantities. A large order for rails could scarcely be placed with the mills for delivery this year, and it is no time for railroads to put down new rails in any case. All the steel which can be made is going into lines of consumption where wants cannot be deferred. In track material there is the usual demand, at unchanged prices as follows: Spikes, 2.25c to 2.30c; track bolts, 2.65c to 2.75c; splice bars, 1.75c to 1.90c; links and pins, 2.15c to 2.25c.

BARS.—Some good orders for bars have been placed for next year's requirements, at current prices, which are unchanged at 2.05c to 2.15c for all muck iron bars and 2.10c to 2.25c for steel bars.

STRUCTURAL MATERIAL.—The structural market is quiet and no business of any importance is being placed. We quote the former schedule of prices as follows: Beams and channels, 3 to 15 inches, 2c; 18 to 24 inches, 2.10c; tees, 2.05c; zees, 2.05c; angles, 2c. Universal mill plates have advanced to 2.40c to 2.50c.

PLATES.—The plate market is very firm at prices formerly quoted. For deliveries in the next month or two an advance of $1 a ton is being secured. Tank plate is being sold for the first quarter of next year at 2 50c. We quote prices for the latter part of the year, and for next year, at unchanged figures as follows: Tank, 2.50c; shell, 2 60c; flange, 2.75c; fire box, 3½ to 4c.

PIPES AND TUBES.—The National Tube Co. will establish general executive offices in the sixth and seventh floors of the Conestoga Building, Pittsburg. The market is unchanged from last week, sales being made for delivery within three or four months at former quotations as follows: Merchant pipe, base discount, 50 per cent and additional discounts two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; ap weld casting, 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½ inch, 40 per cent; 1¾ to 2½-inch, 50 for iron and 55 for steel; 2¾ to 6-inch, 55 for iron and 57½ for steel; extra 5 per cent to dealers.

SHEETS.—The sheet iron market has made another advance and sheets are very difficult to secure, mills being pretty well sold up on sheets for about all the steel they can secure. We quote No. 28 common scarce at 3.10c. Galvanized iron maintains its price of last week, 70 and 5 per cent off, with a 15-cent freight allowance.

OLD MATERIAL.—Prices in old material are very irregular and difficult to quote. Dealers are getting what prices they can. The following figures represent about the position of the market: New melting stock, $17; old steel rails mixed lengths, $16 50 to $17; cut, $17; old iron rails, $21 to $22; wrought iron scrap, $17 to $18; cast borings, $9 to $9.50, net, Pittsburg, busheling scrap, $12.50 to $13, net; car wheels, $17.50, gross; cast scrap, $16.50 to $17, gross; wrought turnings, $11, net, Pittsburg.

SPELTER.—The spelter market is dull and unchanged from last report, 5.75c, Pittsburg.

COKE.—The coke market is in a very strong position, with prices as last quoted, $2.25 for furnace coke and $2.15 to dealers and $2.30 to consumers for crushed and foundry.

CHICAGO.

Office of The Iron Trade Review and Industrial World,
1522 MONADNOCK BLOCK, Aug. 1.

After the partial respite of last week from excessive activity, the same familiar tense conditions are again prominent. Renewed inquiry has been followed by the usual result, a stronger range of values. Pig iron has borne the brunt of the assault of the buyers for material and the melters are paying about a dollar more for Northern grades than the minimum quotations of a week ago. In steel and the finished products the rise in values has been less distinct, but where there has been no advance there is firmness of the old quotations. Bars, sheets and plates are all a little higher, on the whole, though minimum quotations have not been withdrawn in all instances. For all kinds of material the halting consumers, those who neglected to cover anticipated needs months ago when purchases were possible, are now in the market insisting on deliveries in the near future. There are not many of these laggard buyers, but enough to influence the market perceptibly.

PIG IRON.—One of the most trying features of the present pig iron trade is that expected deliveries from furnaces are not being received. This market is getting more than its usual supply of iron from Ohio and from furnaces beyond the usual reach of this field, but it has not been uncommon for furnacemen to sell a future output, only to find that the resumed furnaces are not equal to the expected production. The fresh demand for pig iron, which has appeared during the past week, is for all grades and for all deliveries. The inquiries are above the selling powers of producers and as a result Northern irons are a dollar higher, some grades like Jackson county silveries scoring a much greater advance. It cannot be learned that any large consumers have suffered as yet to any notable degree from lack of iron, but they are nearing the end of their resources steadily and are calling for material in larger quantities than ever. The question of ore supplies is causing considerable anxiety, although there is good prospect that the receipts on Lake Michigan for the season will be adequate unless there is an unexpectedly early closing of navigation. Chicago, in any event, is advantageously situated for all-rail shipments. As revised, quotations are as follows:

Lake Sup. Charcoal	$22 00	@	$23 00
Local Coke Fdy. No. 1	20 50	@	21 00
Local Coke Fdy. No. 2	20 00	@	20 50
Local Coke Fdy. No. 3	19 50	@	20 00
Local Scotch Fdy. No. 1	20 50	@	21 00
Local Scotch Fdy. No. 2	20 00	@	20 50
Local Scotch Fdy. No. 3	19 50	@	20 00
Southern Coke No. 1	19 90	@	20 40
Southern Coke No. 2	19 15	@	19 65
Southern Coke No. 3	$18 65	@	$19 15
Southern No. 1 Soft	19 90	@	20 40
Southern No. 2 Soft	19 15	@	19 65
Southern Silveries	21 00	@	22 00
Jackson Co. Silveries	27 00	@	28 00
Ohio Strong Softeners	22 00	@	23 00
Alabama Car Wheel	19 50	@	20 00
Malleable Bessemer	22 00	@	23 00
Coke Bessemer	22 00	@	23 00

BARS.—Users of iron and steel bars are not obtaining from mill the material they need with desired promptness. For quick delivery the demand considerably exceeds supply. The store trade at Chicago during the past week has been unusually brisk. Wholesale hardware jobbers have done a large carload business. One of the shipments from store from this city was to Boston, Mass. For distant delivery consumers are buying bars, both iron and steel, with evident relish and the market is appreciably stronger for steel. Iron bars are quoted 1.85c to 1.95c and steel from 2c to 2.20c.

STRUCTURAL MATERIAL.—The market has been dragging to some extent this week, mainly because mills cannot furnish the desired material. Prices are firm but unchanged. Quotations follow: Beams 15 inches and under, 2.15c to 2.20c; 18 inches and over, 2.25c to 2 35c; angles under three inches and over six inches, 2.25c to 2.35c; three inches to six inches, 2.15c to 2.25c; sheared plates, 2.85c to 3c; universal plate, 2.75c; tees, 2.20c to 2.30c; zees, 2.20c to

2.30c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—For early delivery, plates are about $2 higher. The trade is practically controlled from store and stocks there are not easily maintained. Tank steel from store is quoted 3.10c to 3.30c. Mill shipments, Chicago delivery, are as follows: Tank steel, 2.80c; shell, 2.90c; flange, 3c; marine, 3c; fire box, 3c to 5c, according to brand.

MERCHANT PIPE.—Steel pipe is strong at 50 to 50 and 10 per cent. The strike of the brick makers has somewhat checked the consumption of pipe in buildings under construction and there is little less urgency in that direction. But the market generally is strong.

SHEETS.—The tendency is distinctly strong. Black sheets are a little higher and galvanized are unchanged. No. 27 black is quoted 3.20c to 3 30c. Galvanized is 70 and 5 to 70 and 7½ per cent from mill and 70 from store.

MERCHANT STEEL.—An advance of $3 per ton has been made in tire steel and of $2 per ton in machinery steel. Demand is keen and sales aggregate a good volume. Smooth finish tire steel is quoted 2.60c to 2.70c; smooth finish machinery steel, 2.80c to 2.85c; spring steel, 3.20c to 3.30c; tool steel, 6c to 7.50c; special, 10c and upwards.

BILLETS AND RODS.—Some open-hearth billets here have been sold at $40. Bessemer billets are nominally quoted at $32 to $34, with no transactions. Rods are held at $45. Trade is very limited, on account of the oversold condition of mills.

RAILS AND TRACK SUPPLIES.—The question of rail deliveries for the year 1900 is already pressing upon the trade for solution. Within the past few days there have been quite a number of inquiries for rails to be delivered during the early months of next year. For standard sections the price quoted is $31 and a little business is said to have been booked at that figure. Light rails are quoted $31 to $37. Splice bars are 1 70c to 1.85c; spikes, 2.40c to 2.50c; track bolts, 2.90c to 3.25c.

OLD MATERIAL.—There seems to be great difficulty in getting the market out of its stable state, but considerable pressure is being felt from initial hands to lift it to a higher range. Prices are nominally unchanged as a rule, though some quotations of a stronger nature are reported. We quote as follows:

Old iron rails, gross,	$18 50@$19 00	Axles, net	$19 00@$20 00
Old steel rails, long, gr.	15 00@ 15 50	Cast borings, net	6 50@ 7 00
Old steel rails, mixed	14 50@ 15 00	Wrought turnings, net	7 50@ 8 00
Old wheels, gross	15 50@ 16 00	Axle turnings, net	8 25@ 8 75
Railroad forge, net	15 50@ 16 50	Mixed steel, gross	11 00@11 50
Dealer's forge, net	12 00@ 12 50	Stove plates, net	7 50@ 8 00
No. 1 mill, net	9 00@ 9 25	Heavy melting steel, gr	13 00@14 00
Heavy cast, net	12 00@ 12 50	Old iron splice b., net.	17 00@18 00
Malleable cast, net	8 50@ 9 00		

WIRE AND WIRE NAILS.—There is a fair trade in nails, good for the season; wire products are quiet. Prices are unchanged. Makers quote single car loads of wire nails on a Pittsburg basis equivalent to $2.80 f. o. b. Chicago, and $2.90 less than car lots. On wire current Chicago quotations are as follows: Plain annealed wire, $2.65; painted barb wire, $2.90; galvanized barb wire $3.40.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.* 27 VINCENT ST., Aug. 2.

The strikes at Lake Erie docks, which caused not a little derangement of iron ore traffic, have been settled in the past week and operations are again on a large scale. In spite of the strike at Ashtabula, O., docks the July ore receipts were 547,207 tons, being greater than those for June, and 56,524 tons greater than for July, 1898. At Lake Superior mines there is steady operation, though with insufficient forces. At the Norrie mines the men made a demand last week for an advance, though it had been agreed in December that the advanced scale then granted should be in force for 12 months. An amicable adjustment is expected. The ore freight market is firm at $1 from the head of the lake, 90 cents from Marquette and 75 cents from Escanaba. Vessel men are making a strong fight for higher rates on coal, and every expedient is being made use of to hold ore rates to the $1 mark. August is expected to show a falling off in the movement of ore, as stockpiles are worked down, but the grain movement meantime will appear as a factor of importance.

PIG IRON.—Inquiries for foundry irons indicate that a considerable tonnage is required for delivery this year, in addition to contracts now on the furnace companies' books. Instances are reported in which current shipments are not equal to the requirements of foundries and urgent requests come from consumers for increased shipments. Some partial shut downs are reported to be imminent—a condition which may be accented unless the added furnaces make more of a showing than is now probable. Central territory will get little relief from this source, in any event. Sales for 1900 delivery continue to be made, usually on the basis of $20 at Central Western furnace for No. 2 foundry. This has been shaded in some cases, and we hear also of higher prices. A round lot of Bessemer iron has been sold in the week, delivery in the last quarter of this year. The quotation is $21 for 1899 iron. For 1900, business can be done at $20. The heavy demand for foundry iron, and the readiness with which sales have been made at $20 for No. 2 have led some sellers to book foundry iron that may eventually be made in large part from the Bessemer ores they have bought. The supply of Bessemer iron from merchant furnaces in the first half of 1900 will be reduced to this extent. At the same time certain consumers of Bessemer will have considerably augmented supplies of metal from their own furnaces in the first six months. Forge iron is very firm at $17.50, valley furnace. Lake Superior charcoal iron stocks, as the official statistics show, declined from about 29,000 tons Jan. 1 to 1,500 tons on July 1. We quote $22 to $23, Lake Erie port, with sellers out of the market on 1899 deliveries:

Bessemer	$20 75	Valley Scotch No. 1	$20 75@21 75
No. 1 Strong Foundry	20 75@ 21 75	Valley Scotch No. 2	19 75@20 75
No. 2 Strong Foundry	19 75@ 20 75	Gray Forge, valley	17 50
No. 3 Foundry	18 75@ 19 25	Lake Superior Charcoal	22 00@23 00

FINISHED MATERIAL.—It is evident that all the vessel building for early 1900 delivery was not included in the contracts announced two months ago. Inquiries for plates for delivery next winter have been made recently. Quotations vary, but it is probable that about $20 a ton more would have to be paid on such business now, than was the basis of the options taken by the shipbuilding companies early in the year. On early deliveries 3c has been realized for tank plates in small lots. A contract for several thousand tons of steel bars was closed in the local market the past week. Present quotations are 2.10c to 2.25c Pittsburg. We quote bar iron at 1.75c valley mill, with $1 a ton extra for cutting. The demand is good and sales are being made steadily. Buyers are coming into the market to some extent for future requirements, but the bulk of the current business is in small lots for delivery this year. It is evident that the year will end with a heavy tonnage unfilled. The tendency is toward higher prices, and the general rule is to provide for early requirements only, but slow deliveries are making a great deal of trouble. We continue to quote 3.10c Cleveland for No. 27 black sheets, and $4 a ton higher out of stock; 70 per cent off on galvanized sheets from stock; 2c Pittsburg for beams and channels.

OLD MATERIAL.—In some lines the market is firmer, though the Republic Iron & Steel Co. has been succeeding quite well in preventing advances in the classes of material it buys. An advance is noted in machinery cast scrap, which is now $14 to $14.50, Cleveland. No. 1 railroad wrought is quoted $17 to $17.25 valley; old steel rails, $15.75 to $16.25 valley; busheling scrap, $12 to $12.50, valley; old iron rails, $21, valley. Wrought turnings are $10.25 to $10.75; cast borings, $10; stove plate, $9 to $10, Cleveland.

CINCINNATI.

Aug. 1.

Matthew Addy & Co. say of the pig iron market: "The blazing heat of the past week might have been expected to have some effect on the iron market, but if it did the effect was not injurious. There is a steady demand for foundry iron for the first six months of next year and orders are being booked for these deliveries in a very satisfactory way. As yet there has been no demand for mill irons for this long forward shipment, but a month's more sales, provided they keep up at the present rate, will dispose of a large part of the foundry iron which the South can make prior to July 1, 1900. Many of the Southern furnaces are still having trouble. Statistics have shown that the output in the South during the first six months of the year was not in excess of the output during the first six months of last year. This amply confirms all that has been said in regard to the impossibility in the South of greatly expanding the production of raw materials in a hurry. The furnaces are cramped for coke and for ore. In the Birmingham district there have been labor

troubles and in addition to these there is an absolute scarcity of labor suitable for the furnaces and the mines. Several thousand more men would be employed in Birmingham to-day could they be secured. The labor problem just now is a very grave one in the South. It has always been the boast of the Southern iron masters that they had a practically inexhaustible supply of cheap and good labor, but the great expansion of business has proved this to be a fallacy. While several additional furnaces are getting into blast in the South, it is not at all probable that the last six months of the year will show any decided increase in production over the first six months of the year. In fact the Southern tonnage is disappointing to the students of statistics, who had taken it for granted because of the immense natural resources of the South and because of the idle furnaces there, that necessarily the output was elastic and could be quickly increased to meet an increased demand. It has been demonstrated that this takes time—a year at the least and probably longer. Soft irons are phenomenally scarce and No 1 soft is now bringing $16 00 at the furnace at Birmingham, which is the price asked for No. 1 foundry. Southern silvery is sold for $17 at the furnace." We quote as follows f. o b. Cincinnati: Southern coke, No. 1 foundry, $19.25 to $19 50; No. 2, $18 to $18.25; No. 3 $17.50 to $17.75; No. 4 and gray forge, $16.75 to $17; mottled, $16.50 to $16.75; No. 1 soft, $19 25 to $19.50; No. 2, $18 to $18.25; Lake Superior coke, No. 1, $20 to $20.50; Lake Superior coke No. 2, $19.50 to $20.00; Hanging Rock charcoal, No. 1, $21 to $22; Jackson Co. silvery, No. 1, $26 to $27; Standard Georgia car wheel, $19 25 to $20.25; Lake Superior charcoal, $22 50 to $23.50.

PHILADELPHIA.

Aug. 1.

There is more buying of pig iron for delivery in the first quarter and first half of 1900 than in the past month. Considerable business of this character has been closed in the past week at current prices, though furnaces are not much inclined to sell for next year. The market shows some variations, the price depending upon deliveries and upon whether the buyer is strenuous about securing the particular brands of iron to which he has been accustomed, differences as wide as $2 being noted on the same grade of iron. On No. 2X foundry sales have ranged as a rule from $20 to $21, $20.50 being a common figure. There is iron to be had for delivery in the last quarter of this year, and some for August and September, though for these near-by deliveries $21 appears to be minimum, as it is with most sellers for the balance of the year. The whole tone of the market favors the view of those who look for higher prices, and it is not considered likely, in view of the foundry requirements yet to be covered for this year, that the added production will be sufficient to stay the advance. On No. 2 plain $19 25 to $19.50 is the ordinary range, and on standard mill iron, $18 to $18.50. On the whole the prevailing opinion in this district is more conservative than the predictions that occasionally come from farther western sections that $25 iron will be seen before the climax of the present movement is reached. Some purchases of billets are reported but the price is not given. One deal between Eastern mills and a Lehigh Valley consumer is noted, involving close to 20,000 tons. The market is nominally $36, which is also the quotation for muck bar. For open-hearth steel $42 to $43 is asked. On refined bar iron the market is quoted 2c to 2.10c. Steel bars are quoted 2.25c to 2.35c. Finished products in all lines are in urgent demand for early delivery and contracts for a portion of 1900 are being made on the basis of current prices. Indications are that the present crowded condition of the mills will continue far into next year, the consensus of opinion that an easing off must come at length having no practical effect so far as the course of buyers reflects the situation. Premiums of $5 a ton and more are paid for early deliveries. We quote tank plates at 2.75c; No. 27 black sheets at 3.40c and No. 28 at 3.50c. Beams and channels are 2.10c for widths up to 15 inches, and the mills are filled up for the most part to the end of the year. In old material there is special firmness in steel, old steel rails being quoted at $16.50 to $17, with the market much in seller's favor For choice railroad scrap, we quote $19 50 to $20.50; No. 1 yard scrap, $15 to $16; machinery cast scrap, $14.50; heavy m lting steel, $16 to $16.50; old iron rails, $21 to $22; old car wheels, $17 to $17.50; iron axles, $25.50 to $26; wrought turnings, $12.50.

LAKE SUPERIOR IRON MINES.

A demand was presented by the men employed at the Norrie mines, Ironwood, Mich., on Wednesday, July 25, for an advance to the following scale: For miners, $2 10 for day work, $2 35 for contract; for trammers, $1.85 for day work, $2.00 for contract; for timbermen, $1.85 per day; for skip tenders, $1.50 per day. The miners' committee was informed by Superintendent Cole that the delegation that conferred with him last December had agreed that if the present scale of wages should then be adopted, the miners would adhere to it for one year before asking any further advance. On reporting this back to the men the committee was instructed to say that the delegation of December was appointed by the pit bosses and had no authority to speak for the men, and that the company would be given three days to comply with the demand. The matter is now in process of adjustment.

Work is in progress looking to the opening of the No. 1 shaft of the Blue mine at Negaunee and underground connection will be made with the new Queen shaft and the No. 2 Blue. The output of 2,000 tons a day will be increased.

At the Carnegie docks at Conneaut, O., there have been unloaded in a single day this year six vessels, the cargoes of which aggregated 21,000 tons of ore. There have been shipped from this port to Pittsburg, via the Pittsburg, Bessemer & Lake Erie Railroad, in 24 hours, as high as 25,000 tons of ore.

An inspection of the Hiawatha mine, in the Iron River district has been made with a view to opening it up. The Minnesota Iron Co. is reported to be negotiating for the Nanaimo mine, Menominee range.

There are now 20 mines in active operation on the Menominee range, sending out an average of 50 000 tons daily. Loretto, West Vulcan, Cyclops, Norway, Aragon, Cundy, Quinnesec, Keel Ridge, Pewabic, Walpole, Millie, Chapin, Traders, Badger, Florence, Dober, Sheridan, Dunn, Columbia, Bristol Lamont, Lincoln, Great Western, Cyrstal Falls, Mansfield and Hancock.

At the present rate of consumption of the iron ores of the Lake Superior region it will not be many years before there will have to be the addition of another iron ore range, as the old ones will be taxed yeyond their capacity to supply the tonnage needed. This sounds a little strange to many of our readers, no doubt, but it will be the condition, nevertheless. There is a vast difference in mining 1,000,000 and 15,000,000 tons per year. Mines that used to send out annually 50,000 tons are now expected to contribute from 300,000 to 500,000 tons. This rate of exhaustion must soon end the life of the biggest properties in the Lake Superior region.—[Iron Ore.

The Auburn mine, Mesabi range, has shipped its stockpile and is now sending out only the daily hoist. The Fabal is nearing the end of its 350,000-ton stock pile. Shipments from the Mesabi range have been pushed vigorously in the past three months and will not continue at the same rate from leading properties in the remaining months.

The Franklin group of the Republic Iron & Steel Co. will ship about 100,000 tons in the balance of the season. The Hibbing Townsite property at Hibbing, Minn., has been sold to a large mining company. It is reported to have an extensive bed of Bessemer ore. For the lease $75,000 and for the fee $200,000 is reported to be the basis of the transfer.

In the United States Circuit Court at Pittsburg, on Friday, July 21, a bill in equity was filed by the Carnegie Steel Co., Ltd., asking for an injunction restraining Edmund W. Heyl and William J. Patterson, comprising the engineering and contracting firm of Heyl & Patterson, from manufacturing an apparatus for casting and conveying pig iron. The defendants, with Julian Kennedy, Charles A. Arthurs and W. Wilson Burns, have just secured a charter for the Pittsburg Casting Machine Co., and it is their intention to manufacture the Heyl & Patterson conveyor on a large scale. The Carnegie Steel Co., Ltd., alleges that the Heyl & Patterson machine is an infringement on a patent of Edward A. Uehling, af Birmingham, Ala., which the plaintiff purchased some years ago. The Carnegie Steel Co. further alleges that the defendants have been manufacturing the apparatus and have thereby caused the Carnegie company great financial loss.

PERSONAL.

John McConnell, superintendent of the open-hearth department of Jones & Laughlins, Pittsburg, has resigned to accept a similar position with the Lukens Iron & Steel Co., Coatesville, Pa.

John Pope, of the engineering department of the Webster, Camp & Lane Machine Co., Akron, O., has been elected general manager of the Falls Rivet & Machine Co., Cuyahoga Falls, O., to succeed J. A. Long, who died recently. Samuel Higgs is secretary and treasurer of the company. A successor to J. A. Long as president has not been elected, but A. S. Chisholm, of Cleveland, the vice-president of the company, is acting president.

President Lambert, of the American Seel & Wire Co., on the eve of starting for Europe was called upon at his home in Joliet, Ill., by his old employes in the wire mills of that city. The men gave three cheers for "the next United States Senator from Illinois." Isaac L. Ellwood accompanies Col. Lambert on his European trip. They will return about Sept. 20.

President and General Manager Geo. L. Carter, of the Virginia Iron, Coal & Coke Co., in a circular dated July 29, makes the following announcement concerning the officers of the company: M. D. Chapman, vice-president, located at the Bristol, Tenn., office will have all the powers of the president in his absence. T. P. Trigg has been appointed assistant to the president. Walter Graham has been appointed general superintendent, with headquarters at Bristol, and will have charge of operations of mines, furnaces, horse shoe, spike and rolling mills, foundries and machine shops. Joseph L. Hunter, M. E., has been appointed mechanical and consulting engineer, with headquarters at Bristol. C. O. Parker has been appointed civil and mining engineer, with headquarters at Bristol. Dayton H. Miller has been made auditor, and C. B. Anderson, assistant auditor, with headquarters at Bristol. William J. Brown has been appointed manager of sales department, with headquarters at Bristol. Frank P. Harmon has been appointed purchasing agent and manager of stores.

Cyrus Robinson, formerly with the E. P. Allis Co., has accepted the position of chief engineer of the Corliss engine department of the Westinghouse Machine Co., Pittsburg.

H. H. Campbell, superintendent of the Pennsylvania Steel Works, has gone on a European trip.

E. H. Gary, president of the Federal Steel Co., has sailed for Europe.

Dr. Wm. B. Phillips, editor of the *American Manufacturer*, Pittsburg, sails on Aug. 9 for Santiago de Cuba, and will return in September.

C. I. O'Connor, formerly superintendent of the National Rolling Mill at McKeesport, of the National Tube Works Co., has been made general purchasing agent of the National Tube Co., and will be located in the company's main offices in the Conestoga Bldg., Pittsburg. He is succeeded at McKeesport by Taylor Alderdice, formerly superintendent of the Monongahela furnaces and steel works.

Maximum Output of Iron Ore in 1898.

The report of the United States Geological Survey on the production of iron ore in the United States for the year 1898 has been completed by Special Agent John Birkinbine. The year recorded the maximum iron ore production for the country, a total of 19,278,396 long tons. This was 1,760,323 long tons, or 10 per cent in excess of the previous maximum of 17,518,046 long tons produced in 1897, and over 1,250,000 tons above the record for Great Britain in 1880, when 18,026,049 long tons were mined. The ores of the British isles also average lower percentages of metal than those of this country and therefore represent a smaller pig metal production.

The iron ores produced in 1898 include red hematite, the output of which was 83 per cent of the total, and brown hematite, which was 10.3 per cent of the aggregate product. Magnetite and carbonate ores make up the remaining 6.7 per cent. The total output in long tons of all varieties by States was: Michigan, 7,346,846; Minnesota, 5,963,509; Alabama, 2 401,748; Pennsylvania, 773,082; Tennessee, 593,227; Virginia, 557,713; Wisconsin, 509,645; Colorado, 318,480; New Jersey, 275,438; New York, 179,951; Georgia and North Carolina, 160,083; Montana, Nevada, New Mexico, Utah and Wyoming, 55,969; Missouri, 50,000; Ohio, 43,868; Kentucky, 12,913; Connecticut and Massachusetts, 20,251; Texas, 9,705; Maryland, 5,941.

INDUSTRIAL NOTES.

Suit has been begun in the United States court at Cincinnati, by E. L. Harper, representing bondholders and creditors of the Etna Iron Works, against the Marting Iron & Steel Co., Ironton, O. The petition says that on Sept. 2, 1895, the Etna Coal & Iron Co., executed a trust deed to Lee & Clark. In 1896, the trustees took possession of the property on account of default of interest, etc., in the name of the bondholders, and in 1897, sold it and bought it in for the Ironton Coal & Iron Co., who later deeded it to the Marting Iron & Steel Co. The plaintiffs claim that the consideration paid by Lee & Clark was a mere fiction and that the bondholders and others in interest held an equity of redemption, which they had endeavored to enforce, but had failed. They ask that the sale of the property to the Marting Iron & Steel Co., be declared null and void, and that the property be restored to its rightful owners.

Charles H. Besly & Co., 10 and 12 North Canal st., Chicago, report numerous shipments of their Helmet oil and Perfection and Bonanza oil cups throughout the agricultural districts all over the country. The demand for this lubricant is just now greater than ever. Referring to foreign orders Besly & Co. report that they are equipping a machine shop in India with lathes, drill presses, chucks, fine tools, etc. A new 1899 catalogue of the firm's specialties is now ready for distribution.

The Morgan Engineering Co., of Alliance, O., has just received two large contracts for electric traveling cranes, one from Russia, the other from Denmark. Negotiations are also in progress looking to the securing of extensive machinery contracts from other European countries, with every indication of success. The plant is being operated to its fullest capacity day and night.

The George B. Sennett Foundry Co., Youngstown, O., has been awarded the contract for supplying the fittings for nine Kennedy hot blast stoves for the Isabella furnaces of the American Steel Hoop Co., at Sharpsburg, Pa.

Henry B. and J. D. Shields, who recently purchased the rolling mill at Wheatland, Pa., have bought the interest of M. Coleman in the Coleman-Shields mill at Niles, and will operte both plants under the name of the Continental Iron Co.

The American Tin Plate Co. is now dismantling the black plate mills at Baltimore formerly operated by the Stickney Iron Co.; the mills at Locust Point, Md., formerly operated by the Baltimore Tin Plate Co.; the mills at Brooklyn, N. Y., formerly operated by Somers Brothers; and the mills at Cleveland, O., formerly operated by the Britton Rolling Mill Co. All of the works named had tin dipping plants connected with them. The company also states that it has secured control of the tin dipping plant at Canal Dover, O., formerly operated by the American Tin Plate Machine & Mfg. Co., and will operate it in connection with its black plate mill at Canal Dover.

The Q. & C. Co., of Chicago, has received a contract from V. A. Kashivenkoff, chief mechanical engineer of the Chinese Eastern Railroad, for the supply of a steam cold metal sawing machine, which will be utilized for cutting steel rails on the Port Arthur section of the road. The same concern has just shipped two portable saws to Australia.

A Mt. Pleasant, Pa., dispatch says: A 5,000-acre coal field is to be developed with 1,200 ovens. C. H. Foote, of Chicago, vice-president of the Illinois Steel Co., and president of the Southwest Connellsville Coke Co., was here last week in company with John P. Brennan, of Scottdale, formerly general superintendent of the McClure Coke Co., and it is said that final arrangements were made for the development of a field in Fayette County. Charles P. Parker, now in the general offices of the Southwest Co. at Morewood will, it is said, be the secretary-treasurer of the new concern.

With the settlement of the strike at the Hibben-Hill boiler works and the John Mohr & Sons' plant, South Chicago, the Chicago boiler-makers' strike has been brought to an amicable end. The men secured the minimum wage scale of 30 cents and an eight-hour day, for which they struck all over the city.

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AND
INDUSTRIAL WORLD.

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BRITISH-AMERICAN TRADE PARALLEL.

The similarity between the general tenor of British and American iron market reports just now is striking. From the London *Iron and Coal Trades Review* of July 21 we take the following. Since it was written, prices have advanced further, 75s. having been paid for No. 3 iron in the Cleveland district:

Keen demand and scarcity of available tonnage continue to constitute the leading features of the pig iron industry, and are accompanied by a continued upward movement in prices. Manufactured iron and steel are likewise in as heavy demand as ever, and here again the requirements are largely in excess of supply, and quotations advancing. Stocks of pig iron are very low, while prices continue to rise. In the Cleveland district No. 3 has again advanced, and 72s. 6d. is being paid for prompt delivery, while both No. 4 foundry and gray forge have also risen, although not to the same extent as No. 3. East Coast hematite [Bessemer], on the other hand, although unusually high [75s.], is cheap compared with Cleveland pig, which is usually about 9s. per ton lower, but at present is only 2s. 6d. less money. Not only is there no diminution in the volume of business doing in finished materials, or in the strength with which prices are maintained, but a steady upward movement, due to the sustained heavy demand, characterizes business in all branches.

A Middlesbrough market letter of July 20 gives this statement of conditions in that important North of England iron center—a comment that in many respects might be duplicated in certain sections of the United States:

A good deal more business could be done than is transacted, and that there is not more is due to the sellers and not to the buyers. The former have not enough iron available, and they cannot appreciably increase the output, because they cannot very well relight any of the idle furnaces on account of the dearth of coke, the make of which is about as large as can be obtained with the existing plant. A very significant and satisfactory feature in our market, and one that indicates very clearly what the views of buyers are with regard to the future, is that consumers are endeavoring to buy not only for delivery over the current half year, but also for delivery over a good part of next year, and they will give for these extended deliveries quite as much as they will pay for prompt. Thus they do not look for an early termination of the satisfactory condition of trade, when they will commit themselves for so long ahead to the present high prices. This feature is observable not only in the pig iron trade, but also in finished iron and steel, and producers have far more work offered to them than they can undertake.

It is becoming better established with every day that 1900 in the iron market of the world will be as 1899, "and yet more abundant."

SPLENDID GAIN IN IRON AND STEEL EXPORTS.

The increase in value of iron and steel exports from the United States for the fiscal year 1899 over that of 1898 was almost equal to the value of all the iron and steel exports of 1890.

From $25,542,208 in 1890, our exports of iron and steel rose to $93,715,951 in the fiscal year ending June 30, 1899. In other words, the value of these exports was nearly quadrupled between 1890 and 1899, and nearly tripled between 1895 and 1899. When the decrease in prices in the past decade is considered, it will be appreciated that the export tonnage of iron and steel and their manufactures, in the recently ended fiscal year, was much more than four times that of 1890.

Of the total increase of $48,000,000 in exports of strictly manufactured articles, in 1899, as compared with 1898, iron and steel and their manufactures contributed nearly $23,000,000, or almost one half.

The above statements give in few words the story of the marvelous expansion of the export trade of the United States in iron and steel. The record of the year ending June 30, 1899, is not fully made up, so far as tonnage is concerned, but the values in leading lines and in those products which are lumped together under general heads, appear from the following statement, as compared with 1898:

	1898.	1899.
Machinery, not elsewhere specified	$13,336,930	$18,722,251
Metal working machinery	4 6:8,683	6,491,586
Pipes and fittings	3 092,016	5,874,228
Steel rails	4.614,376	5,298 125
Iron rails	37,150	141,706
Locks, Hinges, etc	3,997 796	4,898 752
Locomotive engines	3,883,719	4,728,748
Wire	2,593 306	3 891.180
Pig Iron	2,729.995	3.311,295
Sewing machines	3,136,364	3,264 344
Saws and tools	1,430,536	2 943,620
Electrical machinery	2,052 584	2,736.110
Pumps and pumping machinery	2 023,034	2,710,654
Typewriters and parts	1,902,153	2,449,205
Structural iron and steel	1,183,482	1 759,988
Steel sheets and plates	354,579	1,634,866
Other steam engines	1,333,6 9	1 481,523
Castings	834 975	1,055,525
Scrap iron	632,334	1,041,239
Wire nails	458,787	973,434
Cut nails	612,234	604,215
Other nails, including tacks	245,722	286,947
Bars or rods of steel	470,052	944,874
Billets, ingots, blooms	290,827	882,"90
Shoe machinery	895 788	853 936
Printing presses	874,515	847,006
Firearms	672,223	681,440
Rods	330,022	580,490
Stoves and ranges	382,980	503,739
Scales and balances	343,200	390,214
Bar iron	163 261	365,144
Iron sheets and plates	182,809	324 747
Cutlery	156 558	196,040
Safes	87 6 4	145,349
Car wheels	129,446	132,124
Hoop, band and scroll	47,337	107,703
Tin plates, terne plates, etc	962	10,045
All other m'f'r'es of iron	9.305.977	10,450,779
Total manufactures of iron and steel	$70,406,885	$93,715,951

As a matter of interesting comparison, the exports of iron and steel in the past 10 fiscal years are given below:

Fiscal year.	Value.
1899	$93,715.951
1898	70 406,885
1897	57,497,872
1896	41,180,877
1895	32,000,989
1894	29,220,264
1893	30,106,482
1892	28,800,930
1891	28,909,614
1890	25,542,203

It is to be expected that high prices will affect the development of the foreign trade in iron and steel in the coming year; but to-day's prices are scarcely more than on a parity with those aboad in most lines, and in machinery there is every promise of important gains. Such a total as that for the past year is particularly impressive when it is remembered that in 1890 our total exports of all forms of manufactured articles were but $150,000,000, or less than 18 per cent of all exports. In the past year the total value of all manufactured exports was $338,667,794, or 28.15 per cent of all exports, and a gain of $48,000,000 over the record for 1898.

CRITICISMS of consolidations based upon their tendency to limit the opportunity of the coming generation of business men go on the assumption that the trust is unique as a restricter of individual ambition. What shall be said of the labor union regulations which artificially limit the supply of labor in a given trade and thwart the desire of individuals to enter it? Is there any essential difference between the action of a labor organization that denies to a boy the opportunity of learning a trade because the number of apprentices in a given shop is already up to the union-prescribed limit, and that of the consolidation of capital that lessens competition by turning several companies into one and by making difficult the entrance of others upon the same business? Or, changing the subject of comparison, how shall we distinguish between the conduct of the labor union that demands that members of its organization shall work in a given shop and that denies to a non-union man the right to work there and to the employer the right to employ him, and the attitude of an employing firm that insists that no man employed in its works shall belong to a union? While we may not endorse the course of such employers in limiting the liberty of their employes, what warrant exists for a State law forbidding such discrimination by employers, while labor unions in every State in the union have enforced for years their rule of exclusion against workmen who do not choose union membership, and their coercion of employers who would give work to such men? The Pennsylvania State law forbidding the discharge of workmen for membership in a union, or any discrimination against them, has been declared unconstitutional; but why was such a law ever passed, without incorporating in it the prohibition of similar discrimination by the labor combinations? Are not the so-called "friends of labor" among our legislators responsible, not only for some very ill-considered and inequitable laws on labor questions, but for making sentiment by such enactments, for some badly distorted thinking concerning the rights and wrongs of capital and labor?

THE inexact writers who have had much to say of late about the advance in the price of tin plate and its connection with the formation of the tin plate consolidation, will do well to consult British market quotations. Bessemer IC coke plates, South Wales, were quoted 16s on July 20, as against 10s on that date in 1898, practically the entire advance from $2.45 to $3.90 having been made since Jan. 1. Is there not some way of laying this "extortion" at the door of an American "trust"?

CAST-WELDED RAIL JOINT.

The old adage, that the weakest part in a rope proves its maximum strength and durability, holds equally good in track construction; and the rail joint, inasmuch as it demands the greatest care and requires the largest expenditure for maintenance, proves to be the weakest point in tramway building. When we stop to consider the relation existing between a joint and other branches of the service, we find there is not one maintenance or operating account that is not affected detrimentally by poor joints.

The influence of the joints can, perhaps, be more thoroughly appreciated by weighing the different phases of the following quotations from a recent discussion on steel rails: "The stiffer the rail, the less the creeping, due to the wave which runs ahead of the wheel, the less the wear of the ties due to this motion, the less destruction to track and running gear due to the pounding of the wheels, and the easier the hauling of trains."

The cast-welded joint, and the increase in the length of rails from 30 to 60 feet, have, it seems, solved the problem of a smooth and durable track; they give us the long-cherished ideal track without "bumps," and minimize the cost of maintenance. The cast-welded joint was first introduced in 1894, and out of the total of about 35,000 joints welded for one American street railway company, less than one-half of one per cent have broken or shown any sign of defects, notwithstanding the extreme changes in temperature to which they were subjected.

A great deal has been said and written regarding the probable conductivity of the cast joint, and there appears to be no doubt left that the joint, in itself, is as good a conductor of electric current as the rail. The only barrier in the way of a cast-welded joint properly performing the service of a copper wire lies in the degree of amalgamation that takes place when the metal is poured into the mold. However, in event of perfect amalgamation of the two metals, it has been sufficiently proven that the expenditure to bond around the joint with copper is entirely unwarranted. The necessity of thoroughly preparing the rail to insure the highest degree of amalgamation has led to the use of a sand blast cleaning machine. Joints broken open which were cast on a rail cleaned by the sand blast process showed in every case that a flux had taken place between the rail and joint metal, to the extent that the joint, as made up, could be considered a perfect conductor up to the capacity of the rail.—[Cassier's Magazine for August.

ADOLPH JANSSENS, of Paris and Brussels, the largest importer of American machinery in France and Belgium, returned to Europe Saturday. While in this country he purchased nearly $200,000 worth of machine tools and machinery, principally through Manning, Maxwell & Moore, of New York. He bought the equipment for the new Franco-American Co 's shops, now in course of construction in Lisle, one of the important manufacturing towns in France. This establishment will build engines under the rights obtained from the Rice-Sargent Engine Co., of Providence, R. I.

THE American Pig Iron Storage Warrant Co. had 42,500 tons in yard on Aug. 1, 3,400 tons having been withdrawn and none put in after July 20. The reduction in stock since Aug. 1, 1898, is over 200,000 tons, the total in yard on that date being 244,00 tons.

THE Yale & Towne Mfg. Co. is seriously considering an offer from the New Orange (N. J.) Industrial Association to remove its Stamford and Branford, Conn., plants to New Orange.

The South mill of the Lackawanna Iron & Steel Co., Scranton, Pa., made a record of 1,492 tons of rails in 24 hours, recently, the order in hand being for 72-pound rails.

RECEIVED FROM THE TRADE.

W. S. Rockwell & Co., furnace engineers, No. 26 Cortlandt st., and manufacturers of Rockwell's patent duplex system for burning fuel oils, New York, have issued a catalogue 8¼x10 inches, illustrating with full page half tones their various forms of annealing furnaces. The designs presented in this publication are the result of careful study of working conditions, and are reproductions of furnaces now in use in many important manufacturing plants in the United States and Canada. The first furnace shown is calculated for annealing or hardening small work and employs either oil or gas. Print rolls, cutlery, machine parts, gun trimmings, springs, bicycle parts, tools, etc., are annealed in it, the heat being soft and uniform throughout the chamber. The door is on the end and is lined with fire brick A double end furnace is shown, permitting the charging of material at one end and its removal at the other. It will turn out a large amount of work with a moderate consumption of fuel, and gets up heat quickly, being designed for gas or oil only. It is built with working chambers from 18x27 inches up to 3x6 feet. Views and descriptions are given also of a furnace with a revolving chamber; a single-end furnace using oil or coal and having the fire chamber across instead of along the side; a three-door furnace adapted for annealing a variety of articles in packing boxes; a sheet or wire annealing furnace, with the bottom of the working chamber on a level with the mill floor to facilitate the handling of heavy charges in boxes; a double furnace with fire chambers entirely above ground; a copper-annealing and scaling furnace, employing any desired fuel; a double end and single end furnace, adapted to annealing brass and copper in coils, sheets, bars, wire, tubing, etc. The Rockwell machine for handling and distributing oil after the duplex system is built in three sizes.

The fourth edition of the No. 3 catalogue of Fraser & Chalmers presents illustrated descriptions of machinery which modern practice has found best suited to the extraction of gold, silver, lead and copper from ores by roasting, smelting and refining. It is one of 33 catalogues devoted to the extensive lines of machinery this company puts upon the market. There are 168 pages of description and engraving. Sampling plants are described in the first part; then roasting furnaces, including reverberatories, the Brown furnaces, Brückner, White-Howell and Stetefeldt wasters, and muffle furnaces. Smelting furnaces and smelting accessories take up the bulk of the volume, the concluding portion being devoted to copper and lead refining and its equipment. The company says that its new shops in Chicago have over three times the capacity of the former shops. It has also built new shops with large capacity at Erith, Kent. England.

The Joseph Dixon Crucible Co., of Jersey City, N. J., reprints in pamphlet form with numerous illustrations, the articles on brazing by immersion recently published in the *Cycle Age*. Dixon brazing crucibles are employed in the operation.

"Steel and Portland Cement" is the title of a neat pamphlet of the Illinois Steel Co. The company manufactures cement from blast furnace slag, as heretofore described in these columns. The present output of 1,000 bushels of cement a day is to be increased.

What the publishers denominate "a peculiar sort of treatise on feed-water heaters and steam separators," comes from the Harrison Safety Boiler Works, Philadelphia. It is 3½x7½ inches and the 48 pages are well filled with the unique methods of the Cochrane department of publicity. The argument for the economy and efficiency of the Cochrane heater and purifier is the burden of this pamphlet, and it is turned in one way and another to reach every reader at the most advantageous angle.

The Chicago Malleable Castings Co. has closed contracts for the erection of works at West Pullman, near the plant of the Plano Mfg. Co., and will begin operations in September with a force of 300 men, which will be increased later on. Its site consists of 7½ acres of land. The buildings will cover an area of 397 x 500 feet. The company will sell its product largely to local manufacturers. John T. Llewellyn, for some time president of the Belle City Malleable Iron Co., of Racine, Wis., will be largely interested in the works; also W. H. Jones, of the Plano Mfg. Co.

IRON AND STEEL STOCK MARKET.

Denison, Prior & Co., Garfield Bldg., Cleveland, quote as follows from the iron and steel letter of Seymour, Johnson & Co., New York: "The extraordinary demand for iron and steel products continues as great as for several months past. The mills cannot catch up with the demand and so long as that continues, prices must necessarily remain firm. At any rate there is no likelihood of a decline in prices, and everything favors still further advances. Pig iron has sold as high as $21 for No. 2 foundry and as low as $20. It is doubtful if purchases could be made today under $20.50 and more likely $20.75. Billets are quoted nominally at $36. There is great difficulty in getting steel. For finished steel the demand is strong. There would seem to be excellent reasons for the several steel and iron combinations whose stocks are selling in this market, following the example of the American Steel & Wire Co, and publishing at regular intervals a full and complete statement of their condition. This would beget confidence, and where it was merited, higher prices for the stocks and bonds of these companies and the holders would then have some idea as to the real value of their holdings."

Fluctuations in Prices.

The range of prices of the iron and steel stocks for the week ending July 31 and for the present year is given below:

	WEEK.				YEAR.			
	Open	High	Low	Close	Low.		High.	
Am. Car & Fdy	15½	18	15⅜	18	15	June 15	21⅞	May 25
Am. Car & Fdy pr	61¾	66	60¾	66	56⅜	June 16	66	July 31
Am. Steel & Wire..	56¾	59⅜	56	59⅜	45	Feb. 8	72	May 4
AmSteel & Wire pr	96	97½	96	97½	92⅜	Feb. 8	106¾	May 13
Am. Steel Hoop.....	30	34⅜	30	34¼	24	May 24	41¼	May 3
Am. Steel Hoop pr	77¾	79	77	78½	70	May 13	83½	May 4
Am. Tin Plate.....	37⅞	42	37¾	41⅝	33	May 24	52¾	April 4
Am. Tin Plate pr..	85	86	85	86	81	June 1	99½	Feb. 8
Federal Steel.....	58	60½	57½	59⅞	46½	Feb. 8	75	April 3
Federal Steel pr....	80½	82	79⅞	81¾	74½	May 13	93½	April 3
National Steel.....	49½	54⅜	49⅜	54½	43¾	June 2	63	April 24
National Steel pr..	91½	94	91½	94	85	May 15	95	Mar. 28
Pressed Steel Car..	51½	58½	51½	58¾	44¾	June 1	59½	April 13
PressedSteelCar pr	84½	89	84½	89	78	May 25	90	Apr. 13
Tenn. Coal & Iron	68¾	72	68¾	71⅜	36	June 14	72	July 31
Republic Steel, Monday's curb quotations							19 @19¼	
Republic Steel pref. " " "							65¾@66½	

Sloss-Sheffield Steel & Iron Co.

The incorporation in New Jersey of the Sloss-Sheffield Steel & Iron Co., with a capitalization of $20,000,000, is promised for the present week. The stock will be equally divided between preferred and common. The properties included are the Sloss Iron & Steel Co.'s four furnaces, and its coal, coke, limestone and ore properties; Hattie Ensley and Lady Ensley Furnaces, at Sheffield, Ala.; Philadelphia Furnace at Florence, Ala.; the Gulf Coal & Coke Co., in Walker Co., Ala., and the Russellville Coke & Coal properties. Besides the blast furnaces there are 1,500 coke ovens, 62,000 acres of coal lands, 31,500 acres of brown and red ore lands, limestone quarries, 1,200 tenement houses, 31 stores, and warehouses and office buildings. The company will employ over 6,000 men. It will be, with the exception of the Tennessee Coal, Iron & Railroad Co., the largest operating iron and steel company in the South. It controls the ore situation in the Sheffield district, and has intimate railroad connection with all the large centers. It is officially stated that the whole $20,000,000 capital stock will not be issued at the present time. The stockholders of the Sloss Iron & Steel Co., which is capitalized at $5,000,000, will receive in return for their stock shares in the new company. The project will be financed by Charles R. Flint and Frederick P. Olcott, of New York. The Central Trust Co. will act as depository for the transfer of the stock of the Sloss Iron & Steel Co.

The American Boiler Manufacturers' Association, at its concluding session in Cleveland, Thursday morning, July 7, selected Cincinnati as the place of next year's meeting. The election of officers resulted in the choice of the following: President, H. J. Hartley, Philadelphia; vice-presidents, Daniel Connolly, Cleveland; John O'Brien, St. Louis; J. Don Smith, Charleston, S. C.; James Morrison, Pittsburg; M. S. Wiedner, Chattanooga; secretary, J. D. Farasey, Cleveland; treasurer, Richard Hammond, Buffalo.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

The Use of Blast Furnace and Coke Oven Gases [*Engineering*, June 30].—Enrique Disdier, of Bilbao, read a paper on the above subject before the spring meeting of the Iron & Steel Institute. Attention is called to the value of waste gases and the importance of trying to reduce the loss at blast furnaces due to lowering the bell, this loss sometimes amounting to 10 per cent. Blast furnace gases have the disadvantage of being variable in composition, having a low ratio of combustible to non-combustible gas, large amounts of dust and moisture. A badly working furnace means poor and variable gas. If there are a number of blast furnaces this trouble will be regulated to some extent, otherwise producers may have to be kept available to help out at a pinch. The low calorific value of blast furnace gas is no bar to its use in the gas engine, for it only means comparatively larger parts for the same output of power. Dust seems to be the principle objection to the waste gases, for this means high cost for maintenance. Experiments at Seraing with a 200 h. p. gas engine showed that 181 h. p. was developed with a consumption of 117.6 cubic feet of good waste gas per h. p. per hour. This is very economical. To produce a ton of pig iron there is required a ton of coke, and 141¼ cubic feet of waste gas will develop 1 h. p. Now the waste gas of a 100-ton blast furnace, after taking care of the stoves, should generate 2,100 h. p., though only 600 h. p. is actually obtained from the boilers. This loss of 1,500 h. p. is in favor of using gas engines.

A consideration of which we hear little as yet is the use of coke oven gases for power purposes. These gases are not very variable, are rich, dustless and dry. Both the ordinary and by-product ovens have a surplus of gas. In by-product ovens this surplus gas means one pound of coal in the oven equal to an evaporation of one pound of water at 90 pounds, or per ton of coke produced there is available 5 h. p. Sixty per cent of the total gas produced in coking goes to heat by-product ovens, thus leaving 40 per cent for steam purposes. This would mean 44.85 cubic feet of gas per h. p., per hour, which may be considered low. The idea of installing coke ovens adjacent to blast furnaces is strongly argued for the following reasons: The output may be controlled properly, the charges of coal can be mixed as desired, the percentage of broken coke is reduced and moisture kept down, a saving of the comparatively higher freight charges of coke as compared with coal, and the utilization of the waste gases. The advantage of coke oven gas over blast furnace gas for power purposes is about 30 per cent. Coke oven gas is, moreover, a good illuminant, and an ideal gas for steel making.

In the discussion following the reading of the paper (*Ironmonger*, July 6th), Mr. James Riley thought that the difficulties of using blast furnace gases in gas engines can be overrated; he had never known this gas of so poor a quality that it would fail to explode in the cylinders, this from a three year's study and observation. Mr. Savage, engineer at M. Greiner's works in Belgium, read some notes on the subject under discussion. The use of blast furnace gases in the flues of coke ovens is not to be recommended, as the temperature resulting is not high enough to produce good coke. Dust is even more objectionable from coke oven waste gases than from the blast furnace. In fact the experience at Seraing was that with gas just as it came from the furnace the engines had worked continuously for seven months without any difficulty, special devices being used to overcome the accumulation of dust. Mr. Savage thought the advantage of 30 per cent claimed for coke oven gas over blast furnace gas too high. The 200 h. p. engine working seven months with the direct gases ran their electric light plant and was so successful that the blowing engine problem was now under way. The new blowing engines would replace the present compound engines which gave 17,160 cubic feet of air per minute and ran a furnace making 140-150 tons of Bessemer pig iron in 24 hours. These gas blowing engines of single cylinder type were of the following dimensions: working cylinder 4 feet 3¼ inches diameter; blowing cylinder 5 feet 7 inches diameter; stroke 55 inches; 80 R. P. M. The indicated h. p. was about 700 and they expected to get 550 actual h. p. in compressed air at 6.7 to 7.75 pounds per square inch. All valves were very large and the passages were so designed that the speed of the air would be kept at 33 feet per second. Mr. Wood thought that by carrying the gases a long distance and thus cooling them the greater part of the dust would settle. Mr. James recorded several failures to properly use furnace and coke oven gases. Mr. Ward asked if the copious use of oils did not overcome the dust difficulty, and Mr. Savage stated that this was the case at Seraing though there was no excessive amount used. Mr. Disdier, in conclusion, replied to some of the questions asked about the calorific value of the waste gases.

Immigration and Iron Trade Prosperity.

On account of the prosperity in the iron trade in the United States the immigrant inspectors have had to redouble their efforts to enforce the spirit of the law. Workers in American mills have written in a number of cases to relatives abroad to come to this country to secure employment. It being pretty well understood where the employment was to be had. The inspectors have unearthed several cases of this sort, which are claimed to be contrary to the law. A recent steamer brought 19 men, who came at their own expense and were not under contract. The inspector took an oath from each man. One of the statements is a fair sample of all. This man had $30 cash in his possession, and stated that he was going to visit relatives in Elwood, Ind., intending to return after his visit. The men were followed up, and later five of them were found working in a mill in New Castle. They were brought into the mill office and confronted with their affidavits. The mill manager was displeased at their course and promptly discharged them. It is uderstood that the mill management was not connected in any way with the men's coming to this country. A number of such cases have occurred, and in a very few instances the men have been sent back. As a consequence, men are not so ready to leave for the United States as they were.

American Section of the International Association for Testing Materials.

The second annual meeting of the American Section will be held in Pittsburg, on Tuesday and Wednesday, Aug. 15 and 16. The hotel headquarters will be at the Monongahela House. The sessions will be held in the rooms of the Engineers' Society of Western Pennsylvania, 410 Penn ave. Reports will be presented at the first session. In the afternoon a visit will be paid to the Edgar Thomson works of the Carnegie Steel Co. On Tuesday evening and on Wednesday morning the convention will consider the preliminary report of the American members of the International committees on Standard Specifications and Methods of Testing Iron and Steel, the preliminary reports of the American members of the International committees on Cement, Stone and Pants, and the preliminary report of the committee on Impact Tests. A paper on "Comparison of Steel Plates in Flexure and Tension," will be read by Prof. William K Hatt. Opportunity will be given Wednesday afternoon for visiting the works of the Westinghouse Electric & Mfg. Co. and other industrial establishments.

PERHAPS sufficient stress, if any, has not been laid on the position of some of the leading firms of the Cleveland district in the matter of available supplies of raw materials. There is an idea in some quarters that these supplies are approaching near exhaustion. Take Bolckow, Vaughan & Co., as a case in point. Although one of the very oldest firms in the district, Messrs. Bolckow, Vaughan & Co. have, according to Mr. E. Windsor Richards, nearly 40 years' supply of iron ore, and 60 to 70 years' supply of coal in the adjoining Durham coal field. According to the same authority, Bolckow, Vaughan & Co. are likely to greatly outlive the Carnegie company, in Pittsburg, as regards fuel supplies which is distinctly good for Cleveland.—[London Iron and Coal Trades Review.

ST. LOUIS parties are installing new equipment in the plant at Cuyahoga Falls, O., formerly operated by the United States Standard Drawn Steel Co., and expect to manufacture wire specialties. The plant will be in operation by Aug. 15.

THE CUBAN STEEL ORE CO.'S MINES.

In *The Iron Trade Review* of July 20 was given a statement of the organization of the Cuban Steel Ore Co. and the plans of the company for the development of iron ore properties in the Santiago, Cuba, district, 35 to 40 miles west of Santiago. The company is composed of Philadelphia and other Eastern capitalists and has connections through officers of Eastern steel companies that promise a market for a portion of its product. The capitalization authorized is $3,000,000. Recently engineers have gone to the properties the company has taken up and surveys for railroad and dock construction are being made, with the expectation that shipments of ore will begin in midsummer of next year.

The mines in question were acquired for the company by F. A. Bates, of Cleveland, who has had long experience in Lake Superior iron mining. Mr. Bates spent several months in the early part of the year in prospecting in the Santiago district, going also over the iron bearing hills east of Santiago, in the vicinity of the Juragua Iron Co.'s properties and still farther to the east those of the Spanish-American Iron Co., whose pier at Daiquiri was the landing place of the United States troops in the Santiago campaign last year. The iron mining possibilities of the district west of Santiago have been known for years. Some reports on the iron, manganese, and copper bearing rocks there were made in 1892. But the district has been regarded as a reserve to be developed when the requirements of the Cuban ores should exceed the

FIG. 1.—VIEW OF CHIRIVICO HARBOR IN DISTANCE, WITH GUAMA RIVER IN MIDDLE DISTANCE. TAKEN FROM OLD ENGLAND MINE.

FIG. 2.—OUTCROP OF ORE OF THE GRAN VICTORIA, GUAMA GROUP. VEIN 60 FEET THICK.

production of the mines east of Santiago. With the world-wide activity in the iron trade, an outlet for all the ore that can be produced in Cuba seems now well assured.

About 35 miles west of Santiago is Chirivico harbor, the only available shipping point on the coast for a distance of 100 miles, or between Santiago and Manzanillo. This harbor the Cuban Steel Co. controls, having purchased all the land surrounding it. The harbor coast line is semi-circular, with high protecting hills on either side. Coral reefs extend from the promontories and form a natural breakwater, with a channel between amply deep to be safe for trading vessels. From 25 feet at the proposed dock line, the depth of the water increases to 60 feet farther out. The configuration of the shore is regarded particularly favorable for the erection of shipping docks and for other necessary construction. The leases negotiated by Mr. Bates cover two groups of iron veins. The nearest of these to the harbor is known as the Guama group, the Guama river, having its source in these hills and emptying into the sea just west of Chirivico harbor. The Guama group consists of the Old England and New England, 422 acres in all, these being at an elevation of 900 feet. There are also in the Guama group the Gran Victoria, the Pittsburg, and the All Right, which are at higher elevations, the first 1,200 feet, and the others 1,150 feet above sea level. These are regarded by experts who have reported upon them at various times, to be true veins, lying in undisturbed strata which outcrop on both sides of the hills. The veins are 40 to 60 feet in thick

FIG. 3.—BIG OUTCROP OF ORE OF LOWER VEIN AT CATASAQUA MINE—1,300 FEET ELEVATION. UPPER VEIN 500 FEET HIGHER TRACED FOR ⅜ MILE.

ness. Richard Penhale, mining engineer, of New York, who made an examination of the Guama group, reports that at the Old England mine, which is two miles from sea coast, the showing of ore is very large, the outcrop showing a large face 60 feet high and about 40 feet wide, continuing along the ridge over 1,000 feet. The cover is very light, and mining would be easy. To the eastward, half a mile away, he found in a ravine strong indications of the continuation of the same body of ore, of blue black color and showing red powder when ground. Of the Gran Victoria, north of the Old England, and as indicated above, higher in the hills, this expert reported that the ore body was far greater, being from 50 to 60 feet high, 600 feet wide, and showing the entire length of the

FIG. 4.—FACE OF ORE, OUTCROP OF LEHIGH MINE, BAYAMETA GROUP.

hill. He found the ore in both hills apparently in place and considered the formations to be true veins.

The second group of mines are about five miles west of the Guama group. Two are on the Bayamita river—and three on the Huevera—the Lehigh, Catasauqua and Cachita. These five are known also as the Frederick & Boves groups. The veins are from 15 to 30 feet in thickness, with clearly defined outcrops on both sides of the hills. The Detroit is at an elevation of 130 feet above the water; the Michigan 300 to 750 feet; the Lehigh, 1,760 feet; the Catasauqua, 1,300 feet to 1,930 feet, and the Cachita, 1,700 feet. The five cover 1,235 acres.

Analyses of samples from the various mines show ores high in iron and low in phosphorus, as is also characteristic most of the ores of the district east of Santiago. Samples from the Gran Victoria, Old England and New England, taken by C. H. Ziegenfuss, general manager of the Juragua Iron Co., Ltd., showed 68 per cent iron, .08 silica and .021 phosphorus, with a trace of sulphur. Other analyses have ranged from 63.65 per cent iron in specular ores, to 70 per cent in magnetic ore. Phosphorus has shown as low as 0.019 per cent.

It is calculated that ten miles of railroad will be ample for the transportation of ores from the Guama group to Chirivico harbor, the nearest mine being two miles distant, air line measurement, and six miles from the harbor. Mining cost will be low, the bodies being so placed that they can be entered without costly preliminary work. No water is found in the mines, and therefore pumping installations and pumping charges do not figure in estimates of initial or operating expense. Blasting, followed by crushing, will prepare the ore for shipment. From the working level will be dumped into skips, which running down an incline discharge into cars. The skips will be operated by a hoisting drum and will work in balance. The cars will descend by gravity to the harbor. Here one of the plans of construction will be adopted—pocket on shore from which the ore will be dropped into cars running out on to a pier and dumping over aprons into the vessel; or a dock, with pockets, will be built out into the harbor, after the method followed in the Lake Superior region.

The Cuban Steel Ore Co. has acquired the mines mentioned under leases providing for a 10-cent royalty and 5,000 tons annual minimum from each of the two groups. It has acquired in fee and by lease over 2,800 acres of mines, mineral lands and lands extending to the harbor. The distance from Chirivico harbor to Baltimore is 1,440 miles, and to Philadelphia, 1,500 miles. In addition to the market naturally to be found in the United States, the conditions in England and the diminution of Spanish ore deposits on which English steel masters depend, would furnish a good demand from that source also, with the prospect of developing eventually into a large trade. At present prices of ore, and in view of the low cost of mining and of transportation to vessel alongside Caribbean docks, the new company feels assured of profitable operation.

The officers of the Cuban Steel Ore Co. are the following: President, Evans R. Dick; vice-president, Luther S. Bent; secretary and treasurer, Josiah Monroe, who is also secretary of the Juragua Iron Co. Major Bent is also an officer of the Juragua Iron Co., and C. H. Ziegenfuss, superintendent of the latter company's properties is to be in charge of the Cuban Steel Ore Co.'s operations. The directors are Evans R. Dick, Wm. W. Gibbs, Luther S. Bent, Geo. S. Graham, Isaac N. Solis, E. F. Glenn, Herman Michaelson, of Santiago, F. A. Bates and Robert McKinstry. The office of the company is at 1103 Girard Bldg., Philadelphia.

A CRY has gone up all over the country on account of the famine of material for ship construction. As in nearly all other branches of the steel and iron industry, it is not a matter of price, but a question in nearly every case of getting the material at any cost. Prices spoken of in some cases range from $50 to $60 a ton for ship plate at the mill. In a number of cases keels have not been laid simply because material to proceed has been lacking and there can be no doubt that work on new merchant ships everywhere throughout the country, as well as naval contracts of all kinds, will be seriously delayed by existing conditions. Looking to the future, there seems to be no more hope for the ship builder than there was two or three months ago, when $40 was looked upon as a price that would certainly bring relief in the form of increased productive capacity. Increased capacity is expected shortly in a few mills, notably at the Homestead plant of the Carnegie Co., but all this seems to have been anticipated in the orders booked some time ago. Probably when the change comes it will be found that the trouble has been due more to a general demand for material than to the ship building industry having radically outgrown the productive capacity of mills that engage in this line, but it must be admitted that the ship builders, for the time being, at least, are absolutely prevented from planning on future business. They are left to the struggle of trying to get material ordered long ago for work which they have in hand. An amusing feature of the situation is noted occasionally. Some time ago one of the largest steel concerns of the country ordered several cranes from a well-known manufacturer of special machinery of this kind. The order for material for the cranes was given, of course, to the steel company that was to use them. The steel company is now almost daily urging the delivery of the cranes, although they are not themselves able to furnish the material that is to go into them.—[Marine Review.

The Modern Electric Locomotive.

Undoubtedly the modern standard-gauge electric locomotive for heavy duty is, *per se*, the finest piece of apparatus produced for this service. It is a far cry from the first machines built by Siemens, Edison, Daft, and Field, in the late seventies, to the present highly perfected type, performing as routine duty, work, which, a few years since, would hardly have been placed within the possible scope of this class of apparatus, except by the most fanciful imagination.

Contrary to the experience in the other branches of the application of electric energy, the development in this field has by no means been accomplished along gradually progressive lines. During a number of years experimental machines were built and operated in Germany, America, Great Britain and France, but none attained permanent commercial success. Meanwhile, the general art was rapidly advancing, and almost without warning—certainly without any basis of expectation from previous experiments—installations were made which have proved unreservedly successful from the day they were first put in operation.

The close of the year 1890 marked the first permanent invasion of the field of steam railroading by the electric locomotive. In December of that year the City & South London Railway was opened to the public, and the first sixteen locomotives furnished for this installation possessed many features which are characteristic of the best modern practice. But the installation made by the General Electric Co., of New York, in 1895, at Baltimore, for hauling the regular passenger trains of the Baltimore & Ohio Railway, a distance of 14,500 feet through the city, involved the use of the largest electric locomotives ever put in operation.

In judging the future of the electric locomotive, it cannot be assumed that the past affords a basis of much value. The development of electric traction has worked a revolution in the conditions of life, world wide in scope, and of immense beneficial effect, and this within so short a period as to come within the personal observation of those who conceived the first rudimentary apparatus. Twenty years ago they commenced work in the dark, handicapped by a lack of knowledge of the principles they sought to apply, and under the necessity of proving each step taken. The results are, doubtless, far greater than were anticipated even by the inventor's enthusiastic imagination. What will be accomplished in the next 20 years by the engineers of to-day, who are taking up the work with a wealth of positive data in hand and unlimited capital behind them, is a question best left to individual speculation, for in the light of experience, no limit can be set to prophecy, and a serious discussion of the question is impossible —[George R. Mair, in the August number of Cassier's Magazine.

MILLER, Wagoner, Fieser & Co., of Columbus, O., have been appointed by the Marting Iron & Steel Co., Ironton, O., exclusive sales agents for the latter company's foundry irons, brand "Nellie." They offer a limited amount of this iron for delivery in November and December, 1899, and in the first half of 1900.

SILICON CONTROL OF CARBON IN CAST IRON.

The paper of B. S. Summers, of Chicago, at the Buffalo meeting of American Institute of Mining Engineers, has been followed by no little discussion of the relative effects of silicon and carbon in determining the properties of castings made from a given cupola mixture. A contribution to this literature, made by F. E. Bachman, manager of the Buffalo Furnace, Buffalo, N. Y., presents elaborate tables, containing analyses of Buffalo irons. The tables themselves are an interesting study, but space is not available for reproducing them. We present the paper apart from the tables, at the risk of criticism, because we want to put before our readers Mr. Bachman's comments on this important question. It will be seen that like Mr. Summers he makes some departure from the orthodox teaching concerning silicon:

Although it has been apparent to me for a long time that too great weight was currently given to the silicon contents of foundry iron, and that the theory of the control by silicon of the carbon contents of cast iron is unsound, or that, at best, the influence of silicon is too small to be of much practical value as a guide in foundry work, it never seemed to me desirable to enter the lists against either the "silicon-fad" or the theory, for the reason that I had neither the time nor the facilities to prove my position, nor any better theory to offer. But since Mr Summers has taken the step, it seems but right that I should give such facts as are at hand in support of his contention. At the same time I do not think these are enough to prove the case if the contrary proposition were not itself, as it seems to me, based on insufficient evidence.

Both Keep's and Turner's conclusions seem to be drawn from irons carrying less than the normal amount of carbon; Turner's "base" being, moreover, a steel rather than a pig iron, and both the white base and the ferro-silicon of Keep being so low in carbon that compounds of them would not give a material approaching the carbon contents of a normal casting, and having, therefore, little value as showing the effects of silicon on foundry irons, even if his samples were treated under the same conditions as those to which pig metal is subjected in making castings.

If Mr. Keep's compounds were formed by melting in graphite or other crucibles, and the resulting composition (as to elements other than silicon) was estimated, or even (as seems to be the case) neglected, the carbon contents and relations are open to doubt, and all conclusions thus reached are questionable.

I submit herewith a series of 138 analyses of the pig iron of the Buffalo furnace, made in the same furnace during a period of three years, out of ore mixtures varying slightly from year to year, as experience showed to be desirable to improve the quality of the product, together with a few analyses of other standard irons from different sections of the country, which are added for the purpose of showing the difference in compostion of the several irons, and, at the same time, proving that, although the Buffalo iron seems to carry more carbon, and a greater proportion of graphite to total carbon, than the average pig metal, the difference is not so great as to be abnormal, and to prevent silicon from having the same effect in this as in other irons. The Buffalo furnace analyses are all of foundry grades. We try to make nothing else; and we have paid so little attention to the composition of the lower grades that not enough analyses of the latter are available to permit intelligent discussion.

In making up the tables, consecutive analyses have been taken, whether of good or of "off" iron, both of pig irons and of castings.

I think it is acknowledged that, given a normal furnace, with the same burden, the same lime charge, and the same heat of blast, the silicon content of the pig is the gauge of the furnace heat, and that the causes which produce silicon produce graphite, to the point of saturation; therefore, we should expect higher graphite with higher silicon.

The irons in these tables carrying less than 1 50 per cent of silicon were all "special" irons, as will be seen from their lower phosphorus contents. They are therefore not strictly comparable with the others. But, setting these aside, I doubt if there is any tool sensitive enough to tell the difference in cast iron having the carbon here given with the highest and lowest silicon averages; and I am very certain that the 3.14 per cent silicon iron will dull the tool much faster than the 0.75 per cent. However, as the average casting does not contain less than 1.50 per cent of silicon, only the irons here given as containing 1.50 per cent, and upward, of silicon are comparable in practical work: and no one who has analyzed, and also tooled, even two castings, will venture to say that the higher silicon is more desirable for machinery castings, whatever may be its value for very small work, where fluidity is of great importance.

The averages of 97 castings, which were good, bad and indifferent, made for all purposes, show the manganese to vary between 0.37 and 0.50 per cent—a range which is generally acknowledged to be too small to affect the combined carbon. Sulphur and silicon, therefore, are practically the only elements affecting the carbon contents.

As the silicon increases from 1.50 to 3 per cent, we find a gradual decrease of the combined and total carbon, amounting to 0.158 per cent of graphitic and 0.205 per cent of total carbon. The ratio of graphitic to total carbon does not follow the silicon contents at all, although the 2.86 per cent silicon average shows 3.91 per cent more of the total carbon in the form of graphite than does the 1 62 per cent silicon average. On the other hand, 3.32 per cent silicon average contains but 1.10 greater percentage of total carbon in graphitic form than the 1.62 per cent silicon average, a difference too small to confirm the theory that it is due to the silicon. Moreover, the 4.10 per cent silicon average actually shows a smaller proportion of graphitic carbon than the 1.62 per cent silicon average.

According to these series of analyses, if silicon has any influence on the carbon contents of either castings or pig iron, that influence is too small to be of any practical value above a silicon percentage of from 1.50 to 1.75. It is very questionable whether the smaller amount of fuel used, and the lower temperature required, to produce irons containing less than 1.50 to 1.75 per cent of silicon, has not more influence on the proportion of graphitic carbon than the silicon contents of the iron. About 250 pounds more coke is required per ton to make a 2 per cent than a 1 per cent silicon iron, and 350 pounds more to make a 3 per cent than a 2 per cent silicon iron, the furnace using the same ore mixture, operating with a slag of the same composition and temperature of blast.

Looking only at practical results in ordinary foundry work, for which we can compare only such silicon percentages as are found in every-day practice, namely 1.50 to 3 per cent we find

Si, ...	1.62	1.90	2.12	2 37	2.61	2.86
Graphitic carbon, .	2.959	.935	2.9125	2.9366	2 856	2.91

This almost shows a gradual decrease of graphitic carbon, and the lowest graphitic carbon with the highest silicon. Upon inspection of the analyses of the castings, there seems to be, between the sulphur contents and the carbon relations, a close relation, which shows more in individual cases than in the averages; while, in the pig iron analyses, we find that the opener grades, No. 1 and No. 2X, carry the greater amounts of total carbon, graphite and sulphur. I have often noticed that it is much easier to make No. 1 pig iron with 0.03 to 0.04 per cent sulphur than wth less—which seems to be an anomaly.

The only other points suggested by these records of analyses which seem worthy of special attention are the high combined carbon and low silicon contents of the so-called soft irons, especially in the list of Tennessee irons, and the high combined carbons of the high phosphorus irons. Of these irons, two are Alabama all-ore irons; the remainder are all, or largely, cinder irons. It seems reasonable to suppose that the lower graphite contents and higher combined carbon in the cinder iron may be attributed to the fact that cinder absorbs little or no carbon in the higher parts of the furnace, and that, therefore, the pieces not being disintegrated, reduction is not complete before they reach the metal bath of the hearth, still carrying a portion of their original oxygen, which reacts on the carbon of the molten iron. If this hypothesis of reaction is correct, it may explain, and justify to some extent, the once popular prejudice against cinder mixed irons.

The sampling of the Buffalo iron, of which analyses are here given, was done by breaking the pig in the middle and drilling in the center of the fracture. That this does not give an absolutely reliable average sample, I acknowledge; but results obtained under uniform conditions are comparable. The following analyses from three points in the same pig show to what extent the carbon segregates:

	P.	Mn.	S.	Si.	Graph. C.	Comb. C.	Total.	Proportion of Graph. C.
Sow end	0.47	0.38	0.016	3.12	4.18	0.16	4.34	96 36
Middle end,	0.47	0.38	0.018	3.12	3.56	0.14	3.70	96.22
Tail end	0.47	0.38	0.014	3.10	3.79	0.19	3.96	95.02

This shows almost a greater variation in carbon than obtains between 1.80 and 3.14 per cent silicon pig.

PIECE WORK AND THE PREMIUM PLAN.

The piece rate wage system is becoming more and more the important question between employer and employee, next to that of recognition of trades unions. The ordinary plan of piece work remuneration reduces the piece price as workmen become more productive and for this reason the piece work system has often been strenuously opposd by wage earners. The Molders' Union of North America, at its recent convention at Indianapolis declared against piece work and appointed a committee to confer with the National Founders' Association, with a view to giving this declaration practical effect. It is not to be expected, however, that foundry proprietors will coincide with this view.

Modifications of the familiar piece price plan have been put in practice from time to time. At the Detroit meeting of the American Society of Mechanical Engineers in 1895, Fred. W. Taylor, read a paper on "a Piece-Rate System: Being a Step Towards Partial Solution of the Labor Problem." This system, as carried out by Mr. Taylor, in the works of the Mid vale Steel Co., at Nicetown, Philadelphia, consists briefly in offering two different rates for the same job; a high price per piece, in case the work is finished in the shortest possible time and in perfect condition, and a low price, if it takes a longer time to do the job, or if there are any imperfections in the work.

Similar in its general features, though differing in detail, is the premium plan of piece work remuneration, as now in force in a number of leading machine shops and engineering establishments. That it is not popular with the workmen, though correcting some of the alleged injustices of the ordinary piece work plan, is evident from the discussion of this question at the convention of the International Association of Machinists at Buffalo in May. In view of the importance of the subject and its general agitation in machine shop and foundry circles, we reproduce below the report of the discussion, as given in the Monthly Journal of the Association for June:

These extracts comprise (1) the remarks by the Grand Master Machinist in his annual report; (2) the report of the Committee on Law, which was not adopted, together with the discussion thereon; and (3) the report of a special committee, which was adopted, together with the discussion preceding the vote.

The Grand Master Machinist's remarks were as follows:

"One of the most important matters to be considered by the delegates to this convention is the question of piece work, and other plans of paying for work performed by machinists. There is no denying the fact that piece-work and the premium plans are constantly growing in our trade. Although we have succeeded in many instances in preventing the introduction of piece-work, yet the volume of the same is increasing. It is useless for us to any longer hide our heads under a bushel, refusing to squarely face the matter. There is no one who believes more firmly than do I that piece work is detrimental to our trade; it not only works injury to the tradesman, but results disastrously to the employer. We might as well follow the example of that famous bird, the ostrich, that buries its head in the sand, believing that if it can not see it cannot be seen, as to continue our present method of fighting piece work. Firs, because we allow our members in some shops to work under the sytsem; although the same firm may own the shop across the street, our members cannot accept the system there under our constitution. When we go to employers with this state of affairs existing, we are placed in a most ridiculous position.

"During the past two years we have spent more money and devoted more time of the officers to the question of piece work than to any other portion of our trade. In many instances our efforts failed. As a result many lodges were lost to the association. I call your attention to the conditions prevailing on the Chicago, Burlington & Quincy Railroad, where we lost four lodges because of the introduction of piece work. We did all in our power to assist our lodges located on the road to resist the introduction of piece work, but there being a number of our members who were desirous of accepting the plan, made it impossible for us to do anything. In fact, letters were received at headquarters from our lodges on the system, insisting that the Grand Lodge keep its hands off the affair. Lodges have been lost in other sections of the country, not because the Grand Lodge made no effort to prevent the introduction of the system, but in many instances because when the Grand Lodge tried to prevent it, those who were desirous of accepting piece work succeeded in disrupting our lodges. A new plan is now being tried in some localities which, in the main, does away with the old practice of piece work, and introduces what is known as the 'premium plan' of paying for work performed. This guarantees the men that they will receive their regular wages whether the same is made by them or not.

"Mr. F. A. Halsey, associate editor of the *American Machinist*, in the March 9 issue of that paper, gives a plan which is rapidly being taken up by the manufacturers."

Report of the Committee on Law.

The Committee on Law presented the following report:

"Recognizing the great inroads that the premium plans and the two or more machine systems are making into the machine shop of the present day, we believe it is essentially necessary that legislation of a definite nature should be enacted whereby the I. A. of M. can successfully manage and control them. We realize that to further combat the system of premium plans will be suicidal on our part when we consider the fact of the many members of our organization being engaged in them at the present time. Your committee on law realize that this is a knotty problem to solve in presenting a plan whereby we can successfully deal with this question on the start. We do not believe, however, that the plan herewith submitted will, in a measure, serve as a guide wherever the system is in operation, or may be introduced in future. We might also add that practical experience is the greatest teacher in all things and during the next two years we will get the benefit of it, at which time we will be better able to amend or improve the plan herewith submitted.

"Members of the International Association of Machinists can accept premium work under the following conditions:

"1st. That each employee shall be guaranteed his regular day's work wages.

"2d. That the time limits shall never be lower than the average time made with the same tools under the day's work plan.

"3d. That no one shall be discharged because of failure to reduce his time below the limits.

"4th. That, in addition to his regular wages, each employee shall be paid one-half of his regular hourly rate, for each and every hour he may reduce his time below the prescribed limits.

"5th. That the limit once fixed shall not be lowered except through the introduction of new methods of doing the work.

"6th. That all the premiums shall be paid within two weeks of completion of the work upon which they are earned.

"7th. That at the end of one year's time the plan will be withrawn from all those not wishing to continue working under it.

"8th. That if withdrawn the employee shall not be required to work at the same rate of speed without an equivalent in wages.

"9th. Any member of the I. A. of M. working at the premium work system shall not be permitted to earn more than 10 per cent in excess of the average wage paid in that locality. Shop committee shall ascertain each pay day the amount earned by each member under the premium-work system. All over 10 per cent he may earn shall be forfeited to the lodge of which he is a member, and report same to the Financial Secretary of the lodge.

"10th. No member of the I. A. of M. shall be permitted to run two or more machines except where an agreement has been entered into with the organization and the firm. Such an agreement shall only apply to special machines and shall require all machinists to be members of the I. A. of M."

Discussion.

Phillips said no union man could entertain the idea of piece work or running two machines.

Warner claimed that piece work had come to stay. We must either abolish it or control it. The only way to abolish it was by the co-operative commonwealth. We were not ready for that yet. That in a shop in New York the men worked

piece work or premium plan and that all they received above $18 per week was donated to a defence fund. The last clause of the plan, as submitted by the committee, provided for an agreement on the part of the organization and the firm. We could get agreements with nine-tenths of the firms in this country. He moved that we adopt last clause of committee's amendment and insert "or accept piece work" after "two or more machines."

Ingram said we had whipped piece work in Chicago, and now New York was trying to saddle it on us again.

Patterson said it must be decided what running two machines was.

Garner said in his section they had tried to introduce piece work. Man after man had quit work because of it. Now they had got it where the master mechanic said: "We are going to give up piece work; it is causing us too much trouble."

Goodman said it had been for years in operation on the Norfolk & Western system. They saw nothing to do but accept it.

Keeley said he came from a shop which was under the management of the Chicago, Burlington & Quincy. The entire system was working piece work. They had waited upon the manager and asked that piece work be abolished. He had told them it had come to stay. They had again introduced a petition. The delegate who was to have been at this convention was at home now waiting for a reply from the superintendent of motive power. With the co operation of the machinists on the line, they hoped to be able to drive out piece work.

Daglish thought it was a hard nut to crack. But the piece work could be abolished. They had done it in one shop. When the manager was first approached about it, he only laughed, but they had dinged at him, and dogned at him, until he had abolished it.

Wisler said piece work was being worked on the Chicago, Burlington & Quincy system. Thousands of members were working under it. The plan submitted by the committee gave a year in which to try the agreement. At the end of that time it could be withdrawn.

Lewellyn said if we contracted a disease for a year, we could not get rid of it. It was so with piece work; if we worked it for a year we could not then drop it. He had come to the convention pledged to vote against it.

Donivan said he was opposed to piece work. He would be censured should he return to his lodge and report not having opposed it.

Powell said his lodge had fought piece work tooth and nail. He distinctly wanted to go on record as against the system.

Lockhart wanted to testify in regard to piece work. Every inducement had been offered them to accept piece work, but they had refused.

Reynolds, No. 436, said he had driven out piece work by a man taking four weeks to do a job which he could have done in two, and so on.

Warner said he would withdraw his motion. It had brought out healthy discussion, and would perhaps bring about a substitute.

Phillips and Haas moved that it be laid on the table. Lost.

Gregg said no piece work existed in his locality, but he was here to legislate for what would benefit the I. A. of M. at large. Moved that the G. M. M.'s report of piece work be read.

Warner said he had not read G. M. M.'s report but piece work was here and bound to stay, so let us settle the question today, or two years hence we would not have ten delegates to convention. (G. M. M.'s report on piece work read)

The G. M. M. then addressed the convention, saying after great study he felt it was his duty to bring this matter up, as the manufacturers of the country are making strenuous efforts to introduce the piece-work system. He then explained the difference between the piece-work system and what is known as the premium plan. He reported several interviews with firms, and advised the convention to adopt some law that would allow the officers of the I. A. of M. to cope with this evil. Said he hoped some means would be devised to regulate the system, as we had lost nearly all our lodges on the Chicago, Burlington & Quincy from it.

Warner asked to submit a proposition, read same, and asked the G. M. M.'s opinion.

York asked G. M. M. if, under the system, a man spoiling work would have to pay for it.

Foster said the Pan Handle road was offering great inducement to men to do piece work.

Moved by Conlon, G. E. B., that a committee of five be appointed to draft a plan to govern this system. Carried.

No vote appears to have been taken on this report, but it appears the appointment of a special committee was equivalent to rejection. This special committee at a later session brought in the following report:

"Your committee beg leave to report that after due deliberation, we have become convinced that, under the present conditions existing in some parts of our country, we are forced to provide some legislation that will compromise in a manner between those who ask for protection where piece work exists and those who appeal to us for a law which will prevent its introduction; and we further realize the fruitless attempt to drive the monster from among us at the Kansas City convention, when Section 3, Article XXII, in our Constitution became a law, and which from its date has been a dead letter. We therefore annul Section 3, Article XXII, by striking all out and substituting the following:

"That our judicial officers be given discretionary power to treat with employers where piece work now exists with I. A. of M. members, and to make agreements as prescribed in the premium system, and thereby control and eventually abolish piece work in any form."

Moved by Foster and Madigan that the report of the committee be adopted. Wisler said there was no provision in this report to prevent a man from doing piece work. No fine was placed on him. If you want to stamp it out, make it cost a man so much that he will not want to do it.

Senne said the committee had in mind, in making this report, the recommendation of the Law Committee.

Ingram said the committee had discovered that we have been unable to handle the piece work system as adopted at our last convention. The plan adopted at our last convention was thrown down by the referendum vote. He opposed legalizing it in the shop where he was working. It forced men who were honorable to compete with men who were dishonorable enough to work it in order to make a few more dollars.

Lockhart said the plan submitted would control it as much as it ever had been controlled. This prevented piece work from spreading where it does not exist. The way to put that law in operation is by giving the executive officers power to make contracts where piece work now exists. Provision was made for the judicial officers to have power to procure agreements from manufacturers where it now exists and put in the premium plan.

Phillips inquired if this power invested in the Grand Lodge officers would allow them to make contracts with the firm in Cincinnati.

Lockhart said: "If piece work does not exist there, it cannot be introduced."

Kelly said the plan was the best thing he could do. It gives all the production possible to Chicago. It gives the executive officers a chance to prevent piece work going any further. It cannot come into places where it has been stamped out.

Jennings, No. 6, said there was too much in the report. Let us not put anything into our constitution about it. Put it in the hands of the executive officers to accept where it cannot be helped, and stamp it out where possible.

Brown, No. 421, believed the premium plan was just as bad as piece work. In his city the premium plan was introduced into a shop. The men earned $18 to $24 a week. They did not know where to stop. The company had to cut them down. He did not wish to see the premium plan endorsed one iota.

Lockhart said the committee realized the importance of the question—that it was the most complicated one that had come before the convention. We do not want piece work in any form, but we must provide for it where it exists. It was not right to have a law that was violated, as the past law has been. To substitute the premium plan where piece work now existed was a compromise between those who did want piece work and those who did not.

Williams believed the report of the committee was fair. We are not in a condition to-day to antagonize the shops that are already working piece work.

Goodman said it was a matter of organization." He worked in a piece work shop. The men agreed among themselves how much they would earn; but he was opposed to the plan in principle.

Mount stated that he was opposed to the piece work plan, but could see no way out of it

Question called. Report of committee adopted.

THE COKE DEVELOPMENTS OF 1898.

The United States Geological Survey has completed its report upon the production of coke in the United States during 1898. We make the following extracts:

"Recent developments in the construction of by-product ovens where the by products of gas, tar and ammonia are given equal importance with the coke have rendered it necessary to depart from the previous rule of the survey to eliminate statistics referring only to coke obtained in the manufacture of illuminating gas So long as the coke is the primary product, and particularly when the coke is used for metallurgical purposes, its comprehension in these reports is necessary and proper.

"The completion of the bank of 400 ovens at Everett, near Boston, Mass., has been attained as this report goes to press. The product from these ovens while not being primarily blast furnace, foundry or other metallurgical coke, will be the output from the Otto-Hoffman ovens similar to those at Johnstown, and Otto, Pa., and although made from coal to be drawn from Nova Scotia mines may be properly considered as coming within the scope of these reports, and will be so included. As the by-product coke industry develops and extends, as it is sure to do, the scope of this report will necessarily be enlarged. In anticipation of a demand for information as to the amount and value of gas and other products obtained from coal which are produced in the United States the survey has collected from the gas companies and by product coke producers the statistics of the production of gas, tar, ammonia and gas house coke during 1898 and these are presented separately.

"The coal used in coking in the United States is drawn from all five of its great bituminous coal fields, the Appalachian, the Central, the Western, the Rocky Mountain and the Pacific coast. The Appalachian field is the great source of supply, for while there are 13 coke producing states outside the Appalachian field to nine within it, the output outside of the field in 1897 was only 546,954 short tons out of a total product of 13,288,984 short tons, and in 1898 the product outside the field was 660,824 tons out of a total of 16,047,209 tons. From this it will be seen that the states in the Appalachian coal field contributed more than 95 per cent of the total coal product of the United States.

"The statistics of the production of coke in the United States show that the output in 1898 was more than 20 per cent in excess of any previous year in the history of the industry. Exclusive of the coke produced in gas house retorts, and which is not considered in these reports, the coke product of the United States in 1898 amounted to 16,047,209 short tons, against 13,288,984 short tons in 1897. The increase in the product in 1898 as compared with the preceding year was 2,758,225 short tons, or 21 per cent. Prior to 1898 the maximum yearly product was obtained in 1895, when the output amounted to about 45,000 tons more than that of 1897. Some idea of the rapid growth of the coke making industry in the United States may be obtained from the statement that the product in 1898 was 7,500,000 tons, or nearly 90 per cent more than that of 1888, and nearly five times that of 1880, the first year of which there is any record.

"Notwithstanding the fact that the enormous production in 1898 was induced by a demand, which was for a greater part of the year at least fully up to the supply, there was a decline in values, the average price per ton falling from $1.66 in 1897 to $1.59 in 1898. The aggregate value showed an increase from $22,102,514 in 1897 to $25,586,699 in 1898, a total gain of $3 484 185, or 16 per cent, as compared with 21 per cent increase in production. All of the more important coke producing States share in the declining price. In Pennsylvania the average price per ton declined from $1.53 to $1.50, in West Virginia from $1.31 to $1.26, in Alabama from $2.14 to $2.03, in Virginia from $1.40 to $1.32, in Colorado from $2 92 to $2 59 and in Tennessee from $1.81 to $1.63. These six States named in the order of their producing rank contributed 15,703,907 short tons, or 98 per cent of the total product in 1898. Tennessee the smallest of the six in producing importance, had the product in 1898 of 394 545 short tons. Pennsylvania's production increased 1 748,378 short tons, or 19.5 per cent; West Virginia increased 452,405 short tons, or 30.7 per cent; Alabama increased 220,003 tons; Virginia increased 177,094 tons, or 50 per cent; Colorado 132,155 tons, or 38.57 per cent, while Tennessee's increase was only 7 per cent, or 25,776 tons. It must be borne in mind that in this statement the production of New York is included in Pennsylvania, from which the coal is drawn, and Colorado includes the production of Utah, but in neither of the included states was the production sufficiently large to affect the totals or percentages.

"The number of ovens built increased from 47,668 in 1897 to 48,447 in 1898. At the close of 1897, 545 ovens were in course of construction, including 120 Semet-Solvay by-product ovens building at Ensley, Ala.; at the close of 1898, 1,048 ovens were in course of construction including 400 Otto-Hoffman by-product ovens at Everett, near Boston, Mass., and 100 or more of the same type in the Allegheny Mountain district (Johnstown), Pennsylvania. The number of by-product coke ovens in existence at the close of 1898 was 550, including 280 Semet-Solvay, 180 Otto-Hoffman, and 90 Newton-Chambers, 30 of the last, however, not being operated as by product ovens, leaving 520 active. In 1897 the number of active by-product ovens in existence was 280. On Dec. 31, 1897, 195 by-product ovens were building, all of which were completed in 1898, and the close of the latter year saw 500 more in course of construction, 400 of which were put into operation in the summer of 1899.

"The following figures show the production of coke in the leading fields of Alabama, Colorado, Pennsylvania, Tennessee, Virginia and West Virginia.

"Alabama.—Establishments, 25; ovens built, 5,456; ovens building, 100; coke produced, 1,663,020 short tons; value, $3,378,946; yield of coal in coke, 59 per cent.

"Colorado.—Establishments, 12; ovens built, 1,253; ovens building, 3; coke produced, 474,808 short tons; value, $1,230,428; yield of coal in coke, 59.1 per cent.

"Pennsylvania.—Establishments, 151; ovens built, 27,157; ovens building, 292; coke produced, 10,715,302 tons; value, $16,078,505; yield of coal in coke, 65.7 per cent.

"Tennessee.—Establishments, 15; ovens built, 1,949; ovens building, 40; coke produced, 394,545 tons; value, $642,920; yield of coal in coke, 54.6 per cent.

"Virginia.—Establishments, 6; ovens built, 1,564; ovens building, none; coke produced, 531,161 tons; value, $699,781; yield of coal in coke, 62 per cent.

"West Virginia.—Establishments, 87; ovens built, 8,659; ovens building, 161; coke produced, 1,925,071 tons; value, $2 432,657; yield of coal in coke, 61.2 per cent.

"Total of all States.—Establishments, 342; ovens built, 48,477; ovens building, 1,048; coke produced, 16,047,209 tons; total value, $25,586,699; average yield of coal in coke, 63.6 per cent.

"The number of firms engaged in the industry in 1898 was 284, an increase in 15 years of a little more than 20 per cent, whereas the number of coke ovens has increased 140 per cent. In the same period the coke product has increased over 200 per cent, illustrating very clearly the tendency of carrying our large industrial enterprises under one management rather than to distribute the business among the large number of smaller concerns. In 1883 the average number of ovens to each firm or corporation was 79, and the average yearly production by each firm about 23,600 tons. In 1898 the average number of ovens to a firm was 171, and the average production per firm 56,500 tons, showing that while the number of firms has increasd only about 20 per cent, in 15 years, the average number of ovens to each has increased 120 per cent, and the average production per firm 140 per cent.

"Of the 284 firms and corporations from whom reports were received in 1898, 53 produced no coke. The total number of ovens owned by these 53 firms was 2,686, an average of 50 ovens each. One of these firms owned 200 ovens, and 11 others owned between 100 and 150 each. From this it is seen that only one of the idle firms owned as many as the average number of ovens to a firm in 1898 and it appears that nearly all of the idle firms were small producers. In addition to these there were 428 ovens idle, which were portions of plants that produced coke in 1898. All of these latter were in Pennsylvania. The total number of ovens idle in 1898 was 3,114, which, deducted from the whole number of 48,447, leaves 45,333 ovens in active operation during the year. These, distributed among the 231 active firms, made an average of 196 ovens to each, as against an average of 50 for the idle ones.

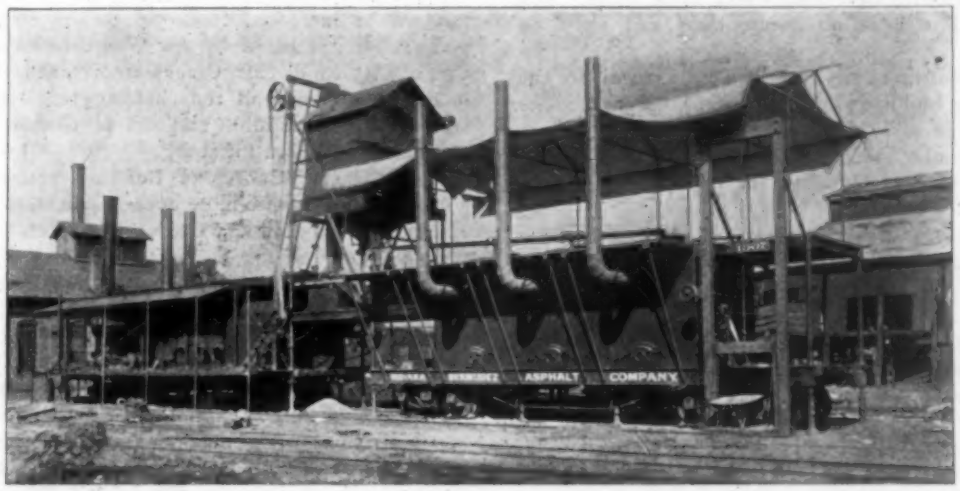
"Of the total number of ovens 3,114 were not operated in 1898 The idle ovens were distributed as follows: Pennsylvania 1,531, or 5.5 per cent; West Virginia, 568, or 6.6 per cent; Alabama, 286, or 5.25 per cent; Ohio, 190, or 43 per cent; Kentucky, 150, or 51 per cent; Tennesee, 128, or 6.6 per cent; New Mexico, 76, or 40 per cent; Montana, 100, or 33 per cent; Indiana, 40, or 43 per cent; Colorado, 30, or 25 per cent; Kansas, 9; Virginia, 4; and Missouri, 2."

A RAILWAY ASPHALT PLANT.

A portable plant for the making of asphalt paving has been devised and successfully introduced by Hetherington & Berner, of Indianapolis, Ind. It has made it possible for smaller towns to secure the benefits of asphalt for street pavement. While particularly designed for the smaller municipalities, it has been in demand also for extensive paving operations in large cities. The mechanical features of the equipment will be of interest, rather than the method of preparing the asphalt, to readers of this paper. The illustration shows the plant as established for operation. As packed for the road, closed and locked, with all the projecting parts stowed away, it takes up no more room than two box cars. Two cars are used, one called the dryer car and the other the melter car. Two sizes are built.

In the three-kettle plant the dryer car is 42 and the melting car 36 feet long. In the four-kettle plant they are 42 feet long each. All dimensions are such, with regards to length, breadth and height, as conform to the rules of railroads and are safely within the limitations imposed by bridges, curves and tunnels. The whole structure is entirely of steel, with the exception of the deadwoods, which are made of oak, on account of its elasticity. The under frame of each car is made of six longitudinal steel members composed of I beams and channels; the whole frame is further strengthened by four heavy truss rods suspended beneath in the usual manner. The body bolsters of the cars are made integral with the frame in such manner as to permit of low platforms or decks. The floors are made of steel plates riveted to the steel sills. Both cars are fitted with automatic couplers and air brakes

Upon the dryer car is established a steam boiler of special design, which is calculated to render satisfactory service even



under the unfavorable conditions often existing when the water that must be used is impregnated with lime or other foreign matter. Experiments in this direction with water tube boilers have demonstrated that while they have advantages in light weight and quick steaming, they give trouble when the water supply is not of the best. Alongside the boiler, upon the deck of the car, is an engine of the plain slide valve type. It has been shown by experiment that this type is more satisfactory in such service than any of the higher classes, such as the automatic, rotary, or those of the high speed type. In addition to the engine and boiler upon this car there is an air compressor, or blowing engine, a boiler feed pump in addition to the injector, a double rotary exhauster, a link belt elevator for serving sand to the drums and another for conveying away this sand after it is heated. There is also established upon this car a pair of compact rotary drums for heating the sand as required; also the shafts, gearings, etc., necessary for the transmission of the power furnished by the engine.

The drying and heating of sand is accomplished in two cylindrical shells, suspended in parallel over a furnace. No internal central shaft is required. One end of each drum is supported by and revolves upon anti-friction rollers.

In operation, asphalt is melted and prepared in the melting kettles, and sand is shoveled into the buckets of the cold sand elevator, seen at the side of the front car in Fig. 1. This delivers the sand into the heating drums, from which it passes into the boot of the enclosed vertical hot sand elevator, by which it is carried up to the screen, and thence falls into the tempering bin. By using the overhead screen the refuse can be carried away by a chute without having to be rehandled. While the sand is being heated the asphalt is ready melted in the kettles and thoroughly stirred in the cylindrical agitator.

The materials being all ready, the operator on the melting car opens a valve in the end of the asphalt pipe line and allows a certain amount of asphalt to flow into a receptacle, in which it is measured. At the same time the operator at the mixer allows the hot sand and the carbonate of lime to fall into the mixer, the bucket of asphalt is poured into it and the whole mass is stirred thoroughly for a limited period. The operator then pulls a lever, which opens a door at the bottom of the mixer and allows the charge to fall into a wagon standing between the cars.

The capacity shown in operation is from 1,250 to 2,000 yards of paving a day.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Massillon, O., Iron & Steel Co. has been incorporated with a capital stock of $150,000. The Massillon board of trade subscribed to $50,000 in stock and granted a site valued at $4,000.

The new Chester, Pa., tube works enterprise is taking shape. Capt Wm. S. McManus, Lawrence W Tucker, Joseph M. Bell, John A. Hock and John M. Callahan give notice that they will make application to the governor of Pennsylvania for the incorporation of the "South Chester Tube Mill" on Aug. 15. Plans for the buildings are under way. Two of them will be over 400 feet long.

C. K. Malden, of Philadelphia, and W. R. Brown and E. D. Doneleen, of New York, are interested in a proposed company that is figuring on going into the manufacture of cast iron soil pipe at Pittsburg.

New Construction:—

A new shop building containing 15,000 square feet of floor space is nearing completion at the Brown & Sharpe Mfg. Co.'s place, and of this an entire floor, or 7,500 square feet, will be used for a new drafting room and engineers' offices. In addition to the usual side windows, the drafting room will be lighted from the top by dormer windows having a northern exposure. Adjacent to this, and next to one of the freight elevators, will be a place fitted up especially for photographing machine tools. This will be an exceedingly large and fine drawing room. Foundations are being put in for yet another building, which will be 385x50 feet, five stories high, with additional short wings or projections in which will be located the power plant, stairways and the washrooms, etc. In this

new building there will be a washroom on each floor. Preparation is being made also for the building of a new foundry. At present 1,750 men are employed, and the buildings are crowded. The five-story building to be added will enable a total of nearly 3,000 men to be employed.

The Shickle, Harrison & Howard Iron Co., employing 800 workmen, has completed arrangements for moving its plant from St. Louis to East St. Louis, the St. Louis council having refused it permission to build a switch to its works. Land has been leased in East St. Louis and work has begun on the foundations of a new building.

At Sharon, Pa., the Wilkes Rolling Mill Co. has broken ground for an addition which will cost $40,000 and give employment to nearly 100 men.

The Sharon (Pa.) Boiler Works Co. has purchased a large plot of ground on Budd ave., Sharon, and will erect a new and modern boiler plant.

The Tyler Charcoal Iron Tin Plate Mills, recently organized by Colonel W. P. Tyler, W. H. Griffiths and others, of Washington, Pa., it is reported will add an open-hearth plant to the works now in course of erection.

Wm. Tod & Co., Youngstown, O., are building an addition 104x100 feet to their erecting department.

Worcester, Mass., papers are publishing columns of matter concerning a new wire and wire nail enterprise with which a number of persons formerly identified with the Washburn & Moen Mfg. Co. will be connected. It is stated that Wm E. Rice will be a large stockholder. Horace Smith, Frank F. Bullard and Charles H. Morgan, head of the Morgan Construction Co., are also named as probable factors in the enterprise.

At Rome, N. Y., the plant of the Rome Tube Co., which is to manufacture seamless brass and copper tubing, is well under way. The buildings comprise a main mill 120x200 feet; a casting shop, 84x50, and a boiler house, 40x135. The buildings are constructed with steel frames and brick walls. The main building will contain an accumulator and an 8-ton traveling crane.

The Chicago & Northwestern has taken out a permit for the construction of new buildings at its car shops, Chicago. The buildings include an addition to the machine shop 100 x 150 feet, 34 feet high, and a boiler shop 120 x 300 feet.

The C., B. & Q. road is planning for the construction of a machine shop at McCook, Neb.

The Logan Mfg. Co., a newly chartered concern that has just located at Phœnixville, Pa., has awarded the contracts for the building of its steel casting plant. Ground will be broken at once.

The Pennsylvania Boiler Mfg. Co., who recently bought the bridge works of John Denithorne, Sons & Co., at Phœnixville, Pa., will proceed at once to erect new buildings and remodel the old ones. As soon as the improvements are completed the company will move its large plant from Germantown to Phœnixville.

The Diamond State Steel Works, Wilmington, Del., have let a contract for acid and basic open hearth furnaces to furnish a daily capacity of 400 to 500 tons. This was placed with W. W. Lindsay & Co., of Philadelphia. The blooming mill and tables are being made by the Mesta Machine Co., of Pittsburg. The large reversing engine, direct connected, umbrella piston, is being made by Wm. Tod & Co., Youngstown, O. The electric charging machine, cars and charging boxes are being made by the Wellman-Seaver Engineering Co., of Cleveland. All of these contracts are based upon such deliveries as shall put the plant in shape to begin running in January next. Julian Kennedy, of Pittsburg, is acting for the company in the construction of their new works, as consulting engineer.

The Pittsburg District :—

The strike of puddlers at Spang, Chalfant & Co.'s plant at Etna, Pa., has been ended by the last of the men securing positions in other mills The plant at Etna is being run with non-union men.

W. J. Carlin, Lewis Block, Pittsburg, who recently purchased the Premier Steel Works, Indianapolis, Ind., intends to have the plant in operation in about a month.

The E. A. Henry Wire Co. has been formed with $20,000 capital stock to acquire a plant at Cuyahoga Falls, O., to manufacture wire products, and will apply for a Pennsylvania charter E. A. Henry will be president, and E. F. Austin and C. C. Lean are interested.

The Mica Machine Co., Pittsburg, has just received its charter. A plant will be erected to manufacture machines for splitting mica for electrical and other work.

The Griffin Mfg. Co., Fayette and Chartiers st., Allegheny, Pa., has been formed to manufacture steel tools, locks and other specialties. James C. Griffin is president and manager, and W. A. Crawford secretary and treasurer. The capital stock is $50,000.

The Phillips Mine Supply Co., Pittsburg, has been reorganized and will be known as the Phillips Mine & Mill Supply Co. The company is adding more and more to its coal works machinery line, the manufacture of machinery for iron and steel mills. A number of additions to the plant are being made, which will almost double the capacity.

Ground was broken last week for 200 houses to be erected on the Pressed Steel Car Co.'s property at McKeesport, Pa., in connection with the large plant which the company is erecting there. The company intends to erect 500 houses altogether.

The old Graff-Bennett mill buildings, Etna, Pa., have been purchased by Jacob S. Coxey, of Massillon, O., who will erect a steel casting plant, using the buildings now standing, which he states are in good condition. There will be a 25-ton and two 15 ton open-hearth furnaces, with a 50-ton, a 25-ton and two 15-ton traveling cranes. Mr. Coxey produces silica sand at Massillon, O., and proposes to erect the buildings at that place, so that the plant will be contiguous to the supply of sand. The buildings are expected to be up in six months.

Juan A. Creel, general manager of the Compania Industrial Mexicana, of Chihuahua, Mex., was in Pittsburg last week purchasing a large amount of equipment for the plant, wihch is the largest in Mexico manufacturing mining machinery. A steel casting plant is being added, and the number of men will be increased from 350 to 500. The steel casting plant is being erected by the Wellman-Seaver Engineering Co., of Cleveland. Mr. Creel stated that for the past 11 years he had been buying all the shafting required for the plant from Jones & Laughlins, and had purchased large quantities of other products in Pittsburg.

E. E. Erikson, Conestoga Building Pittsburg, has closed a contract to erect two more open-hearth steel furnaces for the Pittsburg Steel Foundry Co., at Glassport, Pa., making five furnaces.

Joseph F. Wangler, president of the Joseph F. Wangler Boiler & Iron Works Co., St. Louis, is in Pittsburg to make purchases of boiler plate.

The Empire Coke Co. was recently formed and is applying for a Pennsylvania charter. The principal parties interested are connected with Humphreys Stewart & Co., Pittsburg. W. Y. Humphreys is president, William Harris, secretary, and Hiram Griffin, treasurer. A tract of coking coal lands of about 100 acres has just been purchased near Ruffsdale, in the Connellsville region, from William Leighty and J. S. Ruff. A plant of 100 beehive ovens is to be erected at once and will be completed in about sixty days, and more will be erected later.

The Riter-Conley Mfg. Co., Pittsburg, has taken out building permits for buildings to replace those recently destroyed by fire. There will be a structural department, 110 x 418 feet, to cost $55,000; a store building, 31 x 138 feet, three stories, to cost $8,000, and a power building, of brick, 40 x 165 feet, to cost $6,000.

The North Pittsburg Foundry & Machine Co. will be incorporated at Harrisburg, to engage in a general foundry and steel specialty business, in Allegheny. Plans have been drawn for the construction of a modern plant in Allegheny, on the site of the Carlin Mfg. Co.'s building, which was recently destroyed by fire. The incorporators are David Carlin, president of the Carlin Mfg. Co ; William E. Lee, of Lee & Hamilton; Rudolph Solomon, iron and steel broker; C. C. Henry, of the Carlin Mfg. Co , and Watson B. Adair, of Pittsburg. Plans include a main foundry building of iron construction, 70 x 170 feet, an annex to this building, 50 x 60 feet, besides a number of smaller additions and a brick office building.

The 300 workmen employed in the knobbling department of

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(the cold water from your main, well, pond all the year round, you can, with exhaust water to, say 210° F.—a difference of 160°—with 19% as the average.

giving the full value of exhaust steam, or the ease with which they may be cleaned,

HARRISON SAFETY BOILER WORKS, Clearfield & Seventeenth Streets, PHILADELPHIA, PA.

the W. Dewees Wood Co. mills, at McKeesport, Pa., have been granted a 10 per cent increase in wages.

General Industrial Notes:—

The Western Engine Co.'s engine plant at Painted Post, N. Y., has been bought by the Rand Drill Co. and will be started soon upon the manufacture of air compressing machinery.

A demand by the molders in Youngstown, O., foundries last week for an advance of 25 cents a day, or to $2.75, was granted.

An unusual run of orders for shears is noted by the Lloyd, Booth Co., of Youngstown, O.

The Falcon Iron & Nail Co., Niles, O., has advanced wages 10 per cent.

The Star Brass Works, Kalamazoo, Mich., decided to increase their capital stock from $10,000 to $20,000, it being necessary to double their capacity to care for their increasing trade.

The Penn Iron & Coal Co, of Canal Dover, O. after a quick job of repair work blew in its Dover Furnace July 18. It was out only 19 days. This company is adding an additional hot blast stove, 19 x 75 feet, of the Foote type, and a Southwark blowing engine, 42 x 84 x 60 inches. The new Davies casting machine is expected to be operating in another week.

The Dunbar Furnace Co., of Dunbar, Pa., which at present has one furnace in operation, will remodel and repair the second stack and put it in operation as soon as possible.

A new plant for the manufacture of cold rolled shafting is being erected at Braddock, Pa. A contract for equipment to go in the new plant has been given to the Brightman Mfg. Co., Millersburg, O.

The National Steel Co. has awarded the New Columbus Bridge Co., at Columbus, O., the contract for the erection of a blooming mill in the King, Gilbert & Warner Works at Columbus.

The works of the Puget Sound Wire Nail & Steel Co., Everett, Wash., will be dismantled, as the American Steel & Wire Co. has decided to discontinue manufacturing at that point. The 75 nail machines will be removed to the American company's works at San Francisco. The Sumner Iron Works will take the buildings, engines, etc., for general manufacturing purposes

A syndicate comprising C. C. Kauffman, of Columbia, Pa., and Charles A. Porter, Kennedy Crossman and D. Filbert, of Philadelphia, has bought the plant of the New Haven (Conn.) Rolling Mill Co. for $400,000. While the interests which now own the New Haven property are the same that control the Susquehanna Iron & Steel Co. the plants will retain their respective titles, but will be worked jointly. The New Haven mill is a scrap mill and it is the only plant of its kind in operation east of New York.

An advance on puddling from $3 75 to $4 per ton went into effect Aug. 1 at the Pottstown Iron Co.'s works, Pottstown, Pa., now leased by the Glasgow Iron Co. This is the highest rate paid in that district for 12 years.

Beginning Aug. 1, 7,000 coal miners in the employ of the Tennessee Coal, Iron & Railway Co. and the Sloss Iron & Steel Co. receive 50 cents per ton for mining coal, which is an advnce of 2a½ cents, and a total increase of 15 cents per ton since March 1.

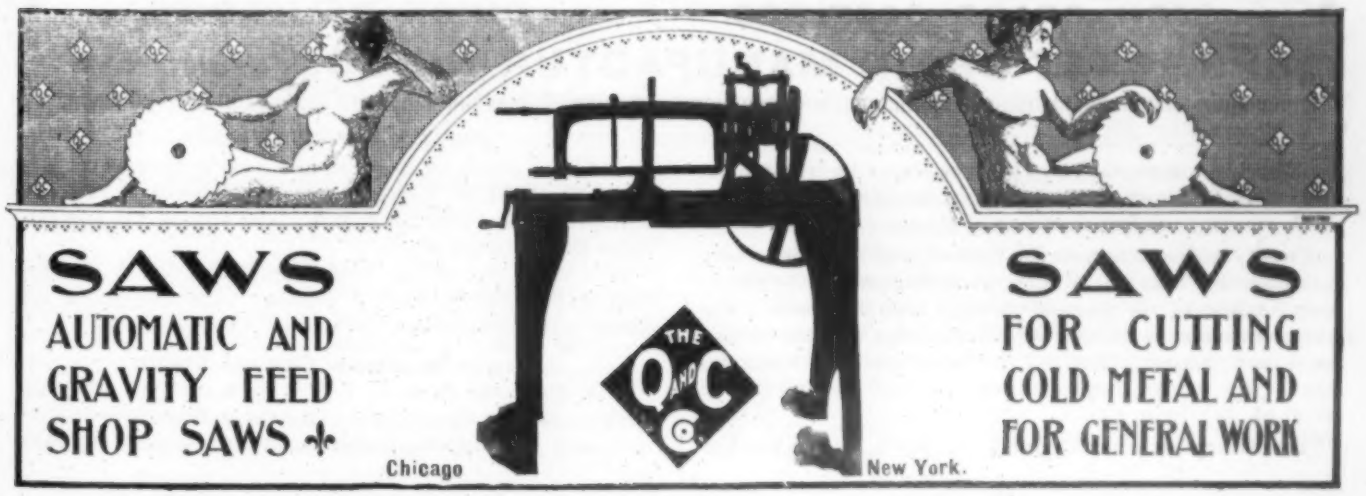
The No. 2 furnace of North Branch Steel Co. at Danville, Pa., has been started up after seven years' idleness.

A consolidation is announced of the Chattanooga (Tenn.) Furnace Co. and the Lookout Mountain Coal & Coke Co., the latter controlling 2,500 acres of coal land. Mines will be opened and coke ovens built.

The Knoxville Iron Co., Knoxville, Tenn., has bought the Lookout Iron Co.'s rolling mill plant at Harriman, Tenn., and will put it in operation.

The furnace of the new Bellefonte Furnace Co., Bellefonte, Pa., idle since 1893, was blown in July 24. In addition to the ore property of the old Bellefonte company the new owners of the furnace have secured the Scotia mines of the Carnegie Steel Co., Ltd.

At Pottsville, Pa, the court has confirmed the sale made



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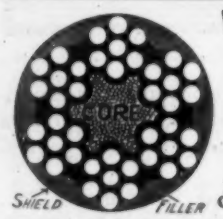

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SPROCKET CHAIN MANUFACTURING CO., Detroit, Mich.

by Receiver Atkins, on July 15, of the Pottsville Iron & Steel Co. to H. P. Brown, of Philadelphia, for $7,800, exclusive of book accounts and first mortgage of $83,000.

Twenty locomotives from the Baldwin and the Schenectady Locomotive Works will be shipped to England in the steamship Nutfield of the Lamport & Hope Line this week. This shipment makes something over 60 American locomotives that have been shipped to England in the past year. The engines are for use in the freight business on the Midland road in Engand.

The Enterprise Boiler Co., of Youngstown, O., has the contract for the stoves for the third new blast furnace of the National Steel Co at Youngstown. The Edward P. Allis Co. will furnish the blowing engine. The first of the new furnaces will be blown in Oct. 3.

John Wood, Jr., of the John Wood Mfg. Co., of Conshohocken, Pa., has received a contract from Europe for his patent water tube boilers, amounting to over $100,000.

$13.50 to Atlantic City and Return

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Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

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No. 11,	Southwestern Limited	*3:30 am
No. 3,	Columbus & Cincinnati Ex.	7:15 am
No. 25,	Wellington Ac. (Sun. only)	8:30 am
No. 33,	Columbus & Cincinnati Ex.	*11:40 am
No. 35	Ind. & St. Louis Express	*12:00 m
No. 27.	Columbus Accom.	4:00 pm
No. 37,	Col , Cin. Express	*6:30 pm
		Arrive.
No. 28,	Cin. & Col. Express	†6.45 am
Fo. 26,	Calion Accommodation	9:45 am
No. 36,	Indianapolis & St. L. Ex	*2:30 pm
No: 46,	Columbus & Cin. Express	*2:55 pm
No. 24,	Wellington Accom.	*6:25 pm
No. 2,	Col., Cin. & Ind. Ex.	9:25 pm
No. 18.	Southwestern Limited	*1:50 am

*Daily.
Nos. 11 and 13 do not stop at the Erie Ry. depot. No. 37, leaving at 8:30 pm.. has local sleeper for Cincinnati. Nos. 33 and 46 have dining cars.
For tickets call on D. JAY COLLVER, City passenger and ticket agent. No. 116 Euclid av. (Colonial Arcade), Cleveland, O.

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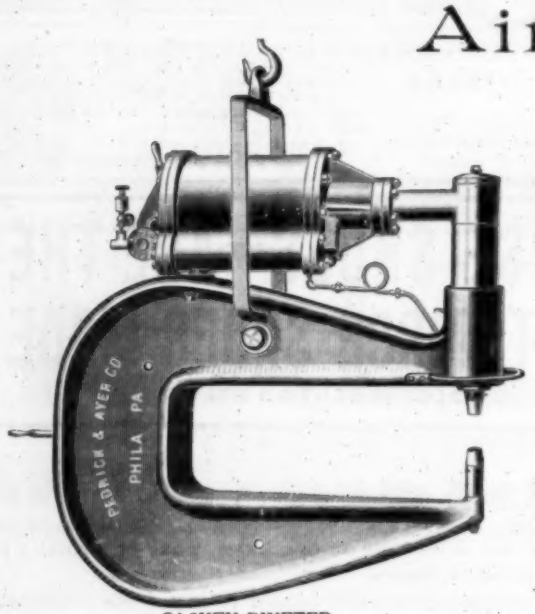

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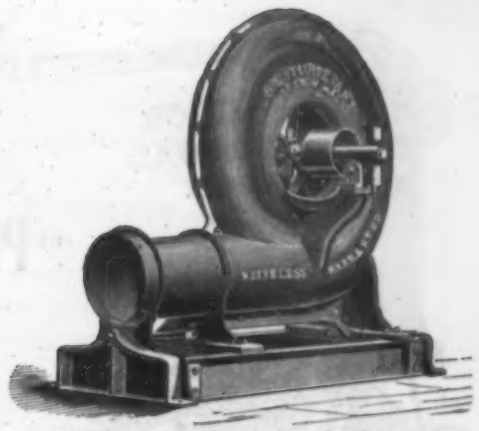

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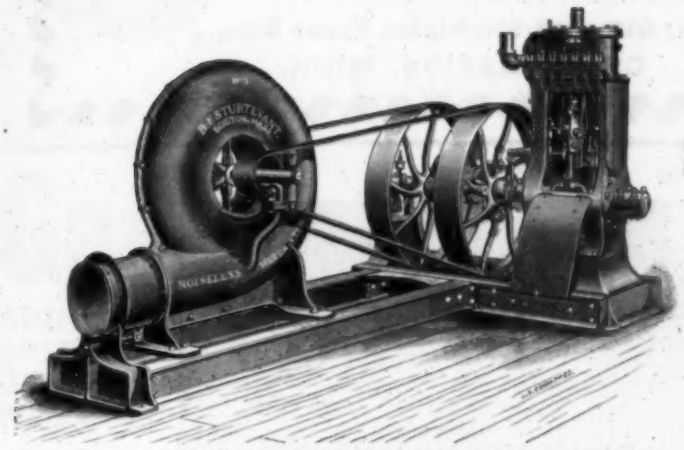

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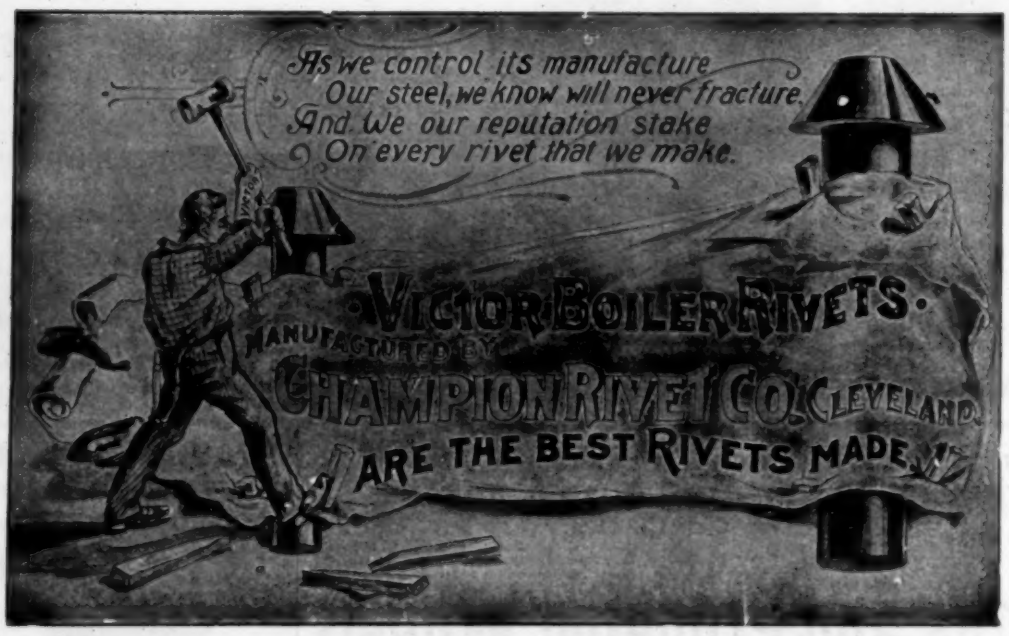
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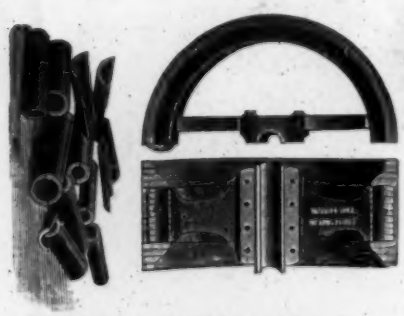

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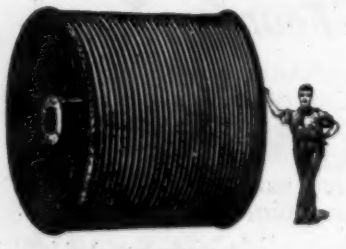

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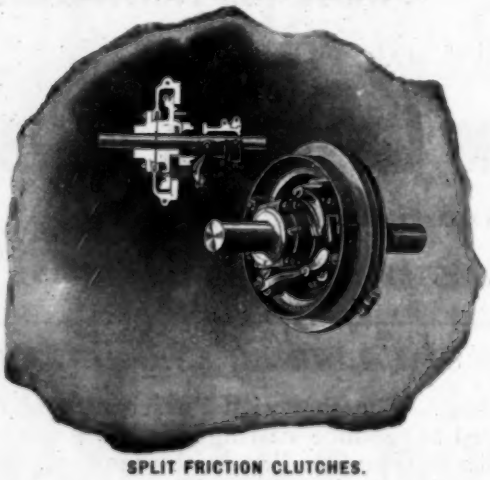

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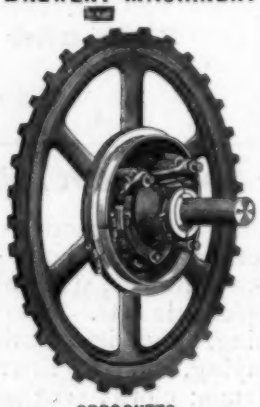

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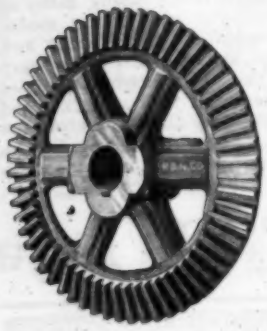

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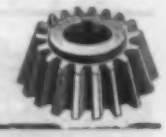

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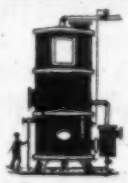

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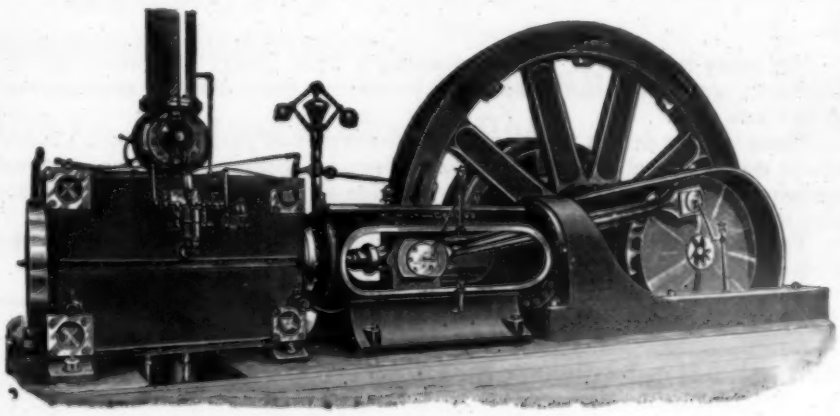

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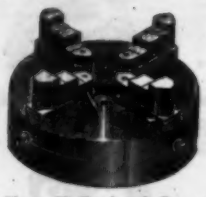
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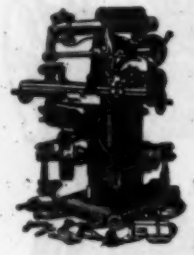
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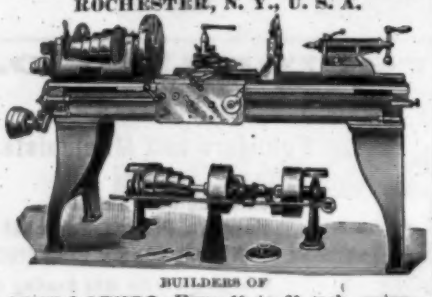
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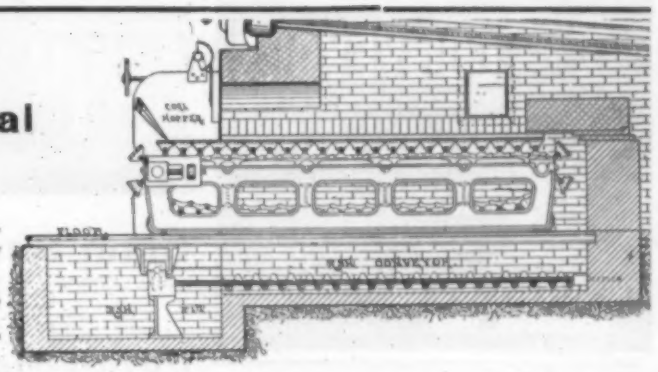

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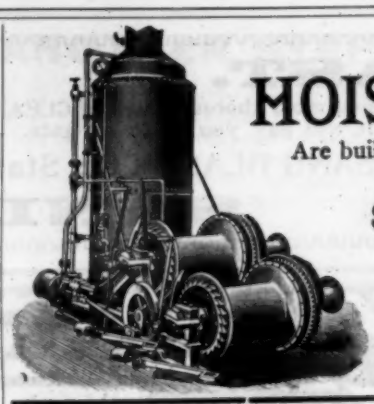

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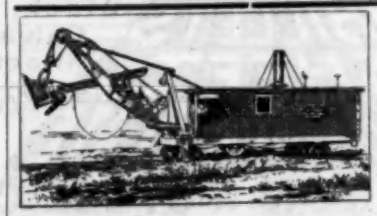

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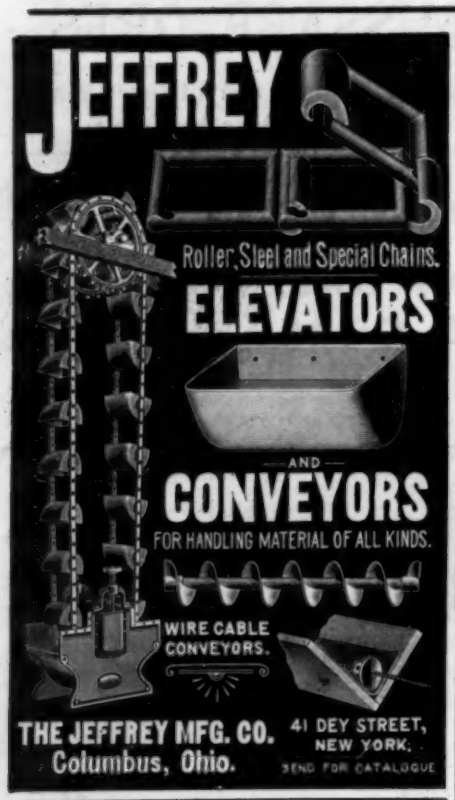

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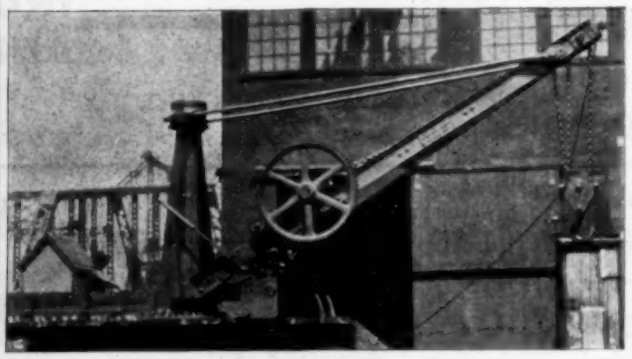

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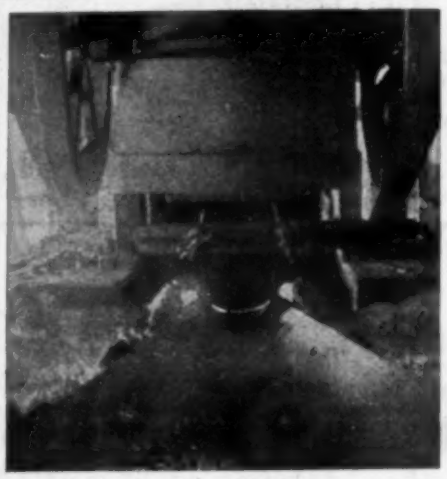

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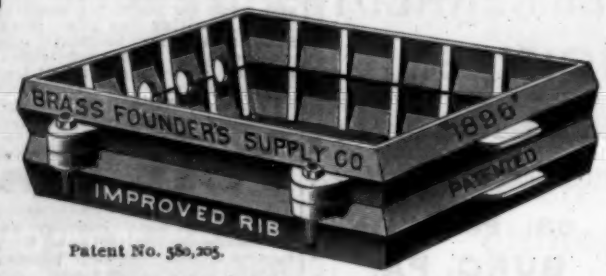

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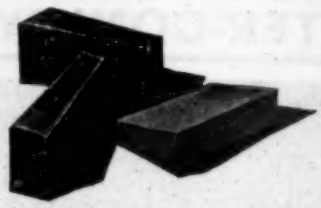

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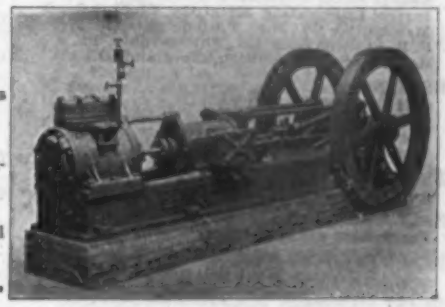

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Jeffrey Mfg. Co., Columbus, O.
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We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES (STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
I. & E. Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

EXHAUST HEATING APPARATUS—
B. F. Sturtevant Co., Boston, Mass.

FANS—
B. F. Sturtevant Co., Boston, Mass.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland, Pa.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.

FIRE PROOF COVERING—
C. H. Besly & Co. Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Excelsior Iron Works Co., Cleveland, O.

FOUNDRY SUPPLIES—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
Henry L. Schwarzenberg, Cleveland, O.
King Improved Sand Blast Co., Detroit, Mich.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FORGINGS—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTERS—
Brainadr Milling Machine Co., Hyde Park, Mass.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GREASE—
A. F. Boettcher, Rowlands, Pa.

GRINDSTONES—
C. H. Besly & Co. Chicago Ill.

GRAPHITE PAINT—
Joseph Dixon Crucible Co., Jersey City N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEATING AND VENTILATING APPARATUS—
B. F. Sturtevant Co., Boston, Mass.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Excelsior Iron Works Co., Cleveland, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.

IRON NAILS AND STEEL—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
R. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning Maxwell & Moore, New York City.

LUBRICATORS—
A. F. Boetticher, Rowlands, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Western Mfg. Co., Springfield, O.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
H. A. Streeter, Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

MILLING MACHINES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Brainard Milling Machine Co., Hyde Park, Mass
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, NewYrok City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
Earl C. Bacon, New York City.
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Shearer-Peters Paint Co., Cincinnati, O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.

PERFORATED SHEET METAL
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

PIG IRON—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.

PLATES—
Enterprise Boiler Co., Youngstown, O
Republic Iron & Steel Co., Chcago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago, Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.

POWER PRESSES—
Bertsch & Co., Cambridge City, Ind.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.

PUMPS (STEAM)—
The Edward P. Allis Co. Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
E. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.

RIVETS—
Champion Rivet Co. Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLLING MILL MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillip s' Sons Co., Philadelphia, Pa

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

SAND BLAST MACHINES—
King Improved Sand Blast Co., Detroit, Mich.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co. Chicago, Ill

SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.

SEAMLESS TUBES—
Shelby Steel Tube Co., Cleveland, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

SHAFTING—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.

SHEET IRON—
Cleveland Rolling Mill Co., Cleveland, O.
Æina-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SPECIAL MACHINERY—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co. Hartford, Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

STEAM SEPARATORS—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

STEEL—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

STEEL BALLS—
Cleveland Ball & Screw Co., Cleveland, O.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.

STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

STEEL BLOOMS AND BILLETS—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Steel Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

STEEL STAMPS AND STENCILS—
J. H. Fleharty & Co., Cleveland, O.

STEEL TUBES—
Shelby Steel Tube Co. Cleveland, O.

STOKERS—
Playford Stoker Co., Cleveland, O.

TANKS—
Enterprise Boiler Co., Youngstown, O
Meehan Boiler & Construction Co., Lowellville O
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

TANK CARS—
The Wm. B. Pollock Co., Youngstown, O.

TIN AND TERNE PLATES—
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

TIN PLATE MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.

TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Monongahela Iron & Steel Co., Pittsburg, Pa.

TRANSMISSION MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

TUBES—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
S. Fix' Sons, Cleveland, O.

TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

TUBE WELDING—
S. Fix Sons, Cleveland, O.

TURNBUCKLES—
Republic Iron & Steel Co., Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.

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C. H. Besly & Co., Chicago, Ill.

TWIST DRILL CASES—
Vulcan Mfg. Co., Pittsburg, Pa.

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Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

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WATER SOFTENING PLANTS—
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Cleveland Rolling Mill Co., Cleveland, O.

WIRE ROPE COATING—
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50 ROOMS AT $2.00
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75 ROOMS AT 3 TO 4.00
All Meals
50¢ Each

BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

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.....Almost no **STEEL EXPENSE**
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"It pays to use the most reliable tool steel in the market."
SANDERSON BROS. STEEL CO.
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ESTABLISHED 1865 ✦ INCORPORATED 1889.
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CRUCIBLE CAST TOOL STEEL.
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OFFICE AND WAREHOUSE: 68 and 70 South Canal St., Chicago.

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FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
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A SPECIALTY.

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All Sizes Made to Order.

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Best Babbitt for Great Weight and Speed. Best all-around Anti-friction Metal.

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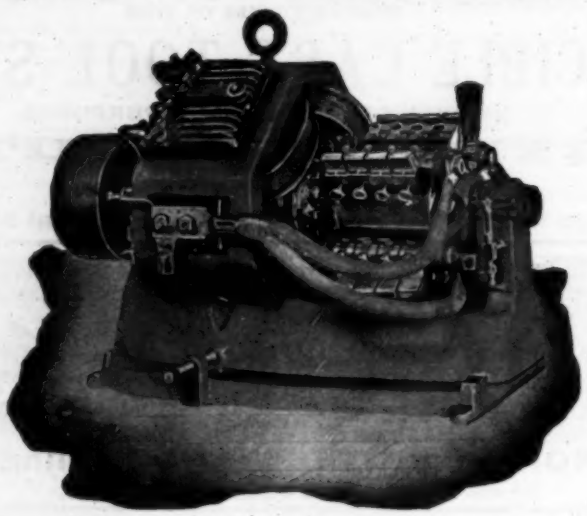

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That is the testimony of the shrewdest and livest of them.

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IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorous hard ore, Bessemer	$4.50
No. 1 Specular, Bessemer	$3.50@ 4.25
No. 1 Bessemer, hematite	3.00@ 4 05
Hematites No. 1 non-Bessemer	2.25@ 2 70
No. 1 Specular, non-Bessemer	2.50@ 7.75
Mesabi Bessemer	2.50@ 2.00

PIG IRON.

Cleveland (f. o. b. cars):

Bessemer	$18.65
No 1 Strong Foundry	$17 75@ 18.75
No 2 Strong Foundry	17.25@ 18 25
Gray Forge red short	16.00@ 16.50
No. 1 American Scotch	17.75@ 18.75
No 2 American Scotch	17.50@ 18.50
Lake Superior Charcoal	19.00@ 20.00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$20.00
Old steel rails (6 ft. and over)	15.00
Old steel rails (6 ft. and under)	15.00
Old car wheels	16.00
	Net Tons.
No. 1 R. R. wrought scrap	$16.50
Mill scrap	11 50
No. 1 Machine cast scrap	13.00
Iron axles	19 00
Axle turnings	11.00
Wrought turnings (free from cast)	10.00
Cast borings	9.00
Uncut wrought iron boilers	7 00
Steel boiler plates	11.00
Grate bars	8 00
Pipes and flues (clean)	10.00
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10.00
Malleable iron	10.50

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	1.85c
Angles	1.85@ 1.95c
Tees	1.90c
Universal plates	2.25@ 2.50c
Sheared plates	2.40c

MERCHANT IRON & STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅞	1.85 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "
6⅝ to 7⅛	2.50 "
¾ to ⅞	.10 "
13-16 to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base
4¼ 0 6 x ⅜ to 1	.10 extra
6¼ 0 8 x ⅜ to 1	.60 "
8¼ 0 10 x ⅜ to 1	.80 "
1⅜ 0 4 x 1 1-16 to 1¼	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1¼ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
⅝ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ¾	.50 "
⅛ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

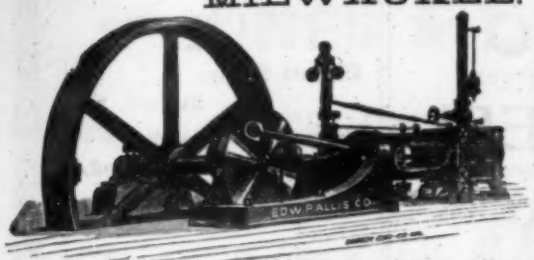
7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1¾ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30
⅝ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ¾ x No. 9 to 3-16	1.00 "
9-16 to ¾ x Nos. 10, 11 and 12	1.10 "

THE EDWARD P. ALLIS COMPANY
MILWAUKEE, WIS.



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Weiss Counter-Current Condensers.

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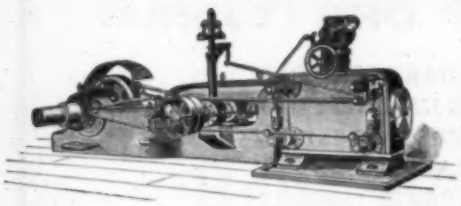
CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pullers.

Belt Elevators, Saw Mills.

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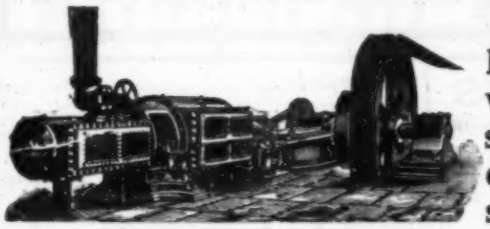

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Park Building, Pittsburg.

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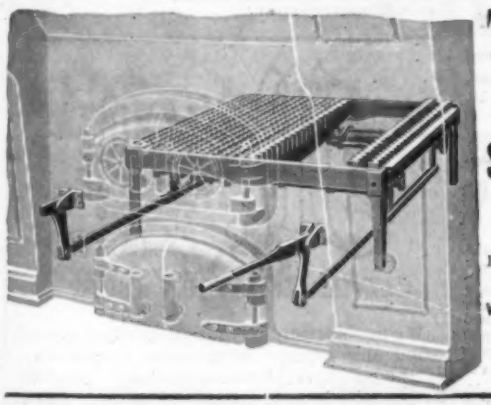

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Manufacturers of the

SENNETT ROCKING GRATE.

ECONOMY OF FUEL.
ECONOMY OF TIME.

Prevents large clinkers. Convenient and Substantial. Apply for circulars.

We make also SENNETT ENGINE. 20 to 40 H. P
SENNETT COMPRESSION COUPLING
and CASTINGS to 5 tons each.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.

7-16 to ½ x No. 9 to 3-16 ..... 1.30 extra
7-16 to ½ x Nos. 10, 11 and 12 ..... 1.40
⅜ x No. 9 to 3-16 ..... 1.50
⅜ x Nos. 10, 11 and 12 ..... 1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .....
Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅛ ..... .40 extra
½ to 13-16 ..... .50 "
⅝ to 11-16 ..... .60 "
¾ to 9-16 ..... .80 "
⅞ to 7-16 ..... 1.10 "
½ to 9-16 x 3-16 ..... 1.00 "
⅝ to 11-16 x ⅛ ..... 1.20 "

Half Oval and Half Round.

2¾ to 3 ..... .60 extra
⅞ to 2 ..... .50 "
¾ to 13-16 ..... .70 "
⅝ to 11-16 ..... .90 "
½ to 9-16 ..... 1.20 "
⅜ to 7-16 ..... 2.50 "
5-16 ..... 3.50 "
¼ ..... 4.50 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes ..... 1 c extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.30 Base Extras.
1⅛ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅛,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base Extras.
7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1¾,	" 22	.25 "
½ to 1¾,	" 13, 14 and 15	.05 "
[illegible]	[illegible]	[illegible]
1⅝ to 1¾,	" 19 and 20	.[illegible] per 100 lbs.
1⅝ to 1¾,	" 21	.30 "
1⅝ to 1¾,	" 22	.30 "
15-16 and 1,	" 13, 14 and 15	"
15-16 and 1,	" 16, 17 and 18	.15 "
15-16 and 1,	" 19 and 20	.20 "
15-16 and 1,	" 21	.25 "
15-16 and 1,	" 22	.35 "
⅞,	Nos. 13, 14 and 15	.30 "
⅞,	" 16, 17 and 18	.35 "
⅞,	" 19 and 20	.30 "
⅞,	" 21	.35 "
⅞,	" 22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
½,	" 13, 14 and 15	.55 "
½,	" 16, 17 and 18	.60 "
½,	" 19 and 20	.70 "
½,	" 21	.80 "
½,	" 22	.90 "
½,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
3-16,	" 13, 14 and 15	1.00 "
3-16,	" 16, 17 and 18	1.10 "
3-16,	" 19 and 20	1.30 "

Sheet Iron.

No. 10	2 35
No. 12	2 35
No. 14	2 4[illegible]
No. 15-17	2 [illegible]0
No. 18	2 65
No. 20	2 85
No. 22-24	2 8[illegible]
No. 25-26	3 00
No. 27	3 20

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 50
Shell	2 60
Flange	2 75

Manufacturers of
BAR IRON,
BAR STEEL,
PLATES,
PIG IRON,
SHEETS (Black & Galvanized)
BOLTS and NUTS,
TURNBUCKLES
T RAILS (8 to 20 lbs.),
COLD ROLLED STEEL,
SPIKES, ANGLES,
CUT NAILS,
HARROW TEETH,
STEEL FENCE POSTS,
STEEL WHIFFLE TREES,
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Manhattan Life Building, New York.
Mermod-Jaccard Bldg., St. Louis, Mo.
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PRESSED STEEL COAL AND ORE CARS

HAVE MADE OBSOLETE EVERY OTHER TYPE OF CARS FOR BULK FREIGHT. THEY ADD FORTY PER CENT TO TRAIN CAPACITY, FOR PAYING FREIGHT; THEY DOUBLE CAR LIFE; THEY DECREASE NUMBER OF CARS REQUIRED FOR ANY GIVEN BULK OF FREIGHT; THEY COST BUT A TRIFLE MORE; THEY ARE FOR THEIR PURPOSE,

THE CHEAPEST AND BEST CARS IN THE WORLD.

PRESSED STEEL CAR COMPANY.

PITTSBURGH. NEW YORK. CHICAGO. JOLIET.

COMPARE WEIGHTS

WHEN YOU ARE TOLD THAT JENKINS '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.

Average weight, ½" "Jenkins '96," 11 lbs. to the square yard.
" " ½" Red Packing, 14 " " " " "
At 50c. per pound "JENKINS '96" is not only very much cheaper, but the best joint packing manufactured.

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FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL.

Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

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Wheeling & Chicago.....	*9:25 P M	†7:25 A M
Akron, Canton & Chicago.....	*8:05 A M	*10:00 P M
Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta....	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore.....	*10:30 A M	*3:25 P M

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Marine Flange	3 00
Fire Box	3½
Above includes plates 90 inches wide.	
90 to 96 in. wide	1c. lb. extra
96 to 100 in. wide	1½c. "
100 to 104 in. wide	2c. "
104 to 106 in. wide	special.

Wrought Pipe and Boiler Tubes.

Merchant pipe, from store	dis. 50 and	10
Boiler tubes, 1¼ to 1½ inch...	Discount	35
" " 1¾ to 2½ inch, iron,	"	45
" " " steel,	"	50
" " 2¾ to 4 inch, iron,	"	50
" " " steel,	"	52½
Casing, screw and socket joint	"	45
Casing, inserted joint	"	35

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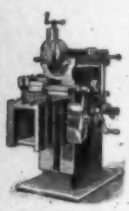

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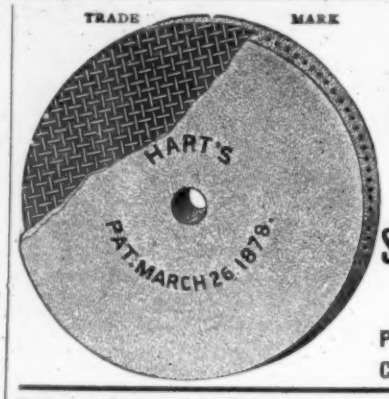

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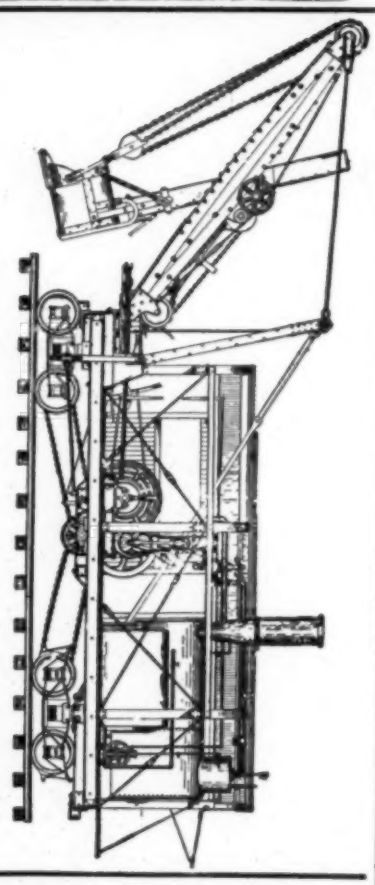

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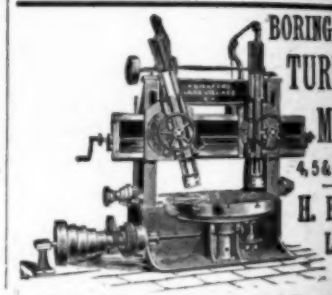

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